IOSH MANAGING SAFELY

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## SUGGESTED ANSWERS

## COURSE STRUCTURE

This textbook has been designed to provide the reader with the core knowledge needed to successfully complete the IOSH Managing Safely course. It follows the structure and content of the IOSH syllabus.

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| Module 1 | Introduction to Managing Safely |
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# User Guide

Before you start to use this textbook, take a moment to read this User Guide.

At the start of each module you will find a Contents table and a list of Learning Outcomes. These are important because they give you an idea of the different topics you will be studying and what you are aiming to achieve.

## KEY INFORMATION

Each main section of material starts with a Key Information box. This box presents an overview of the important facts, ideas and principles dealt with under the section heading. There is no depth or detail here, just the basics.

After the Key Information box comes the main content. The main content has been designed to explain and describe the topics specified in the relevant section of the syllabus to the expected level. Examples have been given to illustrate various ideas and principles in a variety of different workplaces.

## TOPIC FOCUS

Topic Focus boxes provide depth and detail by concentrating on a very specific topic area.

## CASE STUDY

Case study boxes contain examples of real-life scenarios and situations related to the main content and they are very useful for gaining a deeper understanding of the topic.

## MORE...

More... boxes contain sources of further information. (Websites are current at the time of writing.) Although this book includes everything you need, it is worth looking at these additional sources if you can. This will give you a broader and deeper understanding.

## REVISION QUESTIONS

At the end of each section you will find Revision Questions. These are not past exam questions, but should be useful for self-assessment.

You can mark your answers against the Suggested Answers provided.

## GLOSSARY

Glossary boxes contain descriptions or definitions of words or phrases that are included in the main content.

## SUMMARY

Each module finishes with a Summary. This presents a very concise reflection of the key ideas and principles contained in the module. When you have finished studying a module you might use the summary to test your recall of the detailed information contained within the module.

# INTRODUCTION TO MANAGING SAFELY

MODULE 1

## LEARNING OUTCOMES

On completion of this module, you should be able to:

1. Identify the moral, legal and financial reasons for managing health and safety.
2. Outline the impact of a serious accident on the employee, their family, employer and society.
3. Identify a manager's accountability and responsibility for health and safety.

# Contents

## KEY INFORMATION

There are three main reasons for managing health and safety:

- The **moral** reason - the moral duty that one person has to another. Many people are killed, injured or made sick by their work. This is morally unacceptable and society expects good standards of health and safety.
- The **legal** reason - if an organisation is found to be breaking health and safety laws it can be subject to enforcement action and/or prosecution in the criminal courts.
- The **financial** reason - accidents and ill health cost money. When an accident occurs there will be direct and indirect costs associated with that event. Some of these costs can be insured against; many of them will be uninsured.

Organisations and individuals have to manage health and safety within the workplace for various reasons. These reasons can usually be grouped under three main headings: moral, legal and financial. In this module we will explore these three reasons.

### MORAL

The following statistics are compiled by the Health and Safety Executive (HSE). These figures represent yearly averages over recent years. Up-to-date figures can be obtained from the HSE website (www.hse.gov.uk).

Every year in the UK:

- Over 155 workers are killed at work.
- Over 22,480 workers suffer a major injury.
- Over 59,436 workers suffer an over 7-day injury.
- 1.2 million people suffer from an illness they believe was caused or made worse by their current or past work.
- 27.5 million working days are lost:
  - 22.8m due to work-related ill health.
  - 4.7m due to workplace injury.
- Over 2349 people die from mesothelioma.

These statistics indicate that a huge amount of pain and suffering is experienced by people who simply go to work to earn a living. The numbers indicate the scale of the problem.

What the numbers don't do is tell the individual stories. When health and safety is not managed properly people get killed and injured in gruesome ways or suffer terrible diseases that have a massive impact not only on them, but also their dependants, families, friends and colleagues. This suffering is morally unacceptable.

## CASE STUDY

A man severed two of his fingers while operating unsafe machinery at a London bakery in November 2007.

The 26-year-old was attempting to clear a dough blockage when a moving blade severed the middle and ring fingers on his right hand down to the knuckle. The machine was faulty and the rotating blade inside it continued to move even when the rear doors were opened.

Just stop and think for a minute about what the possible consequences might be to you and your family and friends if you were to suffer a serious accident at work.

Aside from the pain and suffering that you might have to endure there could be many other consequences, such as:

- Long term health effects or disability.
- Loss of earnings.
- A legal battle to win compensation.
- A workplace disciplinary hearing.
- Long term sick leave.
- Rehabilitation back to work.
- Re-training.
- Inability to return to work.
- Anxiety and stress.

Your family and friends would suffer indirectly as a result of your accident. If you are the major earner or the main carer for your family, how would they cope?

## LEGAL

Health and safety law requires that an organisation has to manage the risks that are created by its work.

Any organisation suspected to be breaking health and safety law can be investigated by a health and safety enforcement officer. If that officer finds problems in the workplace they can use enforcement action to either force the organisation to improve standards or prevent the organisation from carrying out certain work. If the officer finds a serious breach of health and safety law, they can prosecute the organisation and/or individuals in the criminal courts. If the prosecution is successful, the organisation would be fined. Individuals can also be fined and/or jailed.

### GLOSSARY

**CRIMINAL LAW**

The branch of law concerned with the prosecution and punishment of offenders.

Breaches of health and safety law are punishable in the criminal courts.

### CASE STUDY

A Council was fined £80,000 in the criminal courts in January 2011 after an elderly lady died when she fell through an access hole in her hallway floor which had been left uncovered by council employees working on her property.

The fatal accident happened in July 2009 when the 90-year-old lady walked into the hallway of her house to go to her bathroom. She fell into an unguarded access hole and suffered major injuries from which she later died. Council employees were carrying out gas repair works as part of a programme to upgrade the central heating systems in all of the council's domestic properties. The work involved fitting new radiators, pipework, a boiler and electrical control systems. As the pipework runs under the floors, the floorboards were lifted in order to do the job.

The other big legal implication for any organisation that fails to manage health and safety properly is that when accidents or ill health occur the organisation is going to be sued in the civil courts for compensation. This personal injury claim is completely separate from the enforcement action mentioned above.

### GLOSSARY

**CIVIL LAW**

The branch of law established to create a route for compensation for injured parties.

The legal aspects of health and safety management will be dealt with in more detail later in Module 4.

## CASE STUDY

A 61-year-old tool setter who was off work for more than 20 months following a workplace accident received £35,000 in compensation.

The man tripped on a piece of metal flooring which hadn't been bolted down properly in June 2007. Staff members had made complaints to the company about the hazard before the accident but it was not fixed.

He broke his left finger, severed the muscles in his shoulder and damaged his knee. He needed surgery to correct his shoulder, received intensive physiotherapy and returned to work on light duties in 2009.

## FINANCIAL

The financial reason for managing health and safety is simply that accidents and ill health cost an employer money.

When an accident occurs there will be direct and indirect costs associated with that event. Some of these losses can be insured against, but many cannot. The financial impact of accidents and ill health can have significant effects on the profitability of an organisation and in some cases can lead to bankruptcy.

When an accident occurs there are two types of losses that the organisation may face:

- **Direct costs** - the measurable costs arising directly from the accident.
- **Indirect costs** - those which arise indirectly as a consequence of the event.

Indirect costs are often difficult to quantify precisely and may be hard to identify. In certain circumstances they may be extremely high.

Costs associated with poor health and safety performance can have a direct impact on the bottom line

Just stop and think for a moment about all of the possible costs to the employer that might follow on from a serious workplace accident.

## TOPIC FOCUS

Examples of direct costs:

- First-aid treatment.
- Employee sick pay.
- Repairs to, or replacement of, damaged equipment and buildings.
- Lost or damaged product.
- Lost production time whilst dealing with the injury.
- Overtime to make up for lost time.
- Costs associated with the rehabilitation of the injured employee and their return to work.
- Fines in the criminal courts.
- Compensation payable to the victim, which is likely to be met by insurance cover and will therefore result in an increase in insurance premiums.

Examples of indirect costs:

- Loss of staff from productive duties in order to investigate the incident, prepare reports, undertake hospital visits, deal with relatives, attend court proceedings.
- Loss of staff morale (which impacts on productivity and efficiency).
- Cost of remedial action following an investigation, e.g. change of process or materials and/or the introduction of further control measures.
- Compliance with any enforcement notice served.
- Cost of recruiting and training temporary or replacement labour.
- General difficulties in recruiting and retaining staff as an indirect result of the accident.
- Loss of goodwill of customers following delays in production and fulfilling orders.
- Activation of penalty clauses for failing to meet delivery dates.
- Damage to public image and business reputation.
- Damage to industrial relations, perhaps leading to industrial action (e.g. strikes).

It is possible to take out insurance to cover some of these losses. It is **compulsory** to take out **employers' liability insurance** so that if an employee is killed or injured at work there is insurance in place to pay compensation. The minimum amount of cover is currently **£5 million**. The current certificate must be put on display.

It is not possible, however, to insure against all losses. Some losses are uninsurable by their very nature. For example, you cannot take out an insurance policy to pay money should you be prosecuted and fined in the criminal law courts. Other examples of possible uninsured losses include:

- Loss of raw materials due to accidents.
- Sick pay for injured workers.
- Overtime to make up for lost production.
- Repair to damaged equipment.

It has been estimated that uninsured losses are between eight and thirty-six times greater than insured losses.

## REVISION QUESTIONS

1. In three words sum up the reasons why an organisation should manage health and safety.
2. How many fatal workplace accidents are there each year in the UK on average?
3. Give three direct costs and three indirect costs that might arise from a workplace accident.
4. What is the minimum amount of employers' liability insurance that an employer must have?
5. What punishment can a criminal court give an individual who has been found to have broken health and safety law?

(Suggested Answers are at the end.)

## KEY INFORMATION

Managers have **responsibility** for the health and safety standards in the areas under their control. Managers also have **accountability** for the health and safety standards in the areas under their control.

In law, the employer is responsible for ensuring acceptable standards of health and safety at work. The 'employer' is the organisation itself. However, the organisation is run by people – its managers. So responsibility for fulfilling the employer's legal duties for health and safety fall on the management of the organisation.

Managers at all levels of the organisation therefore have a legal duty to manage health and safety within the part of the organisation that they have control over. This is true of senior managers, middle managers and junior managers. Whatever level you may be at within the organisation, if you have any degree of management control within the organisation then you have health and safety responsibilities for those things under your control.

It is important to recognise that, as a manager, **you are responsible** for the health and safety of the workplace and workforce in your areas. Health and safety is not the responsibility of the health and safety department or the health and safety consultant; they are there to give advice.

It is also important to recognise that managers are not only responsible for health and safety in their areas; they are also **accountable** for health and safety in those areas. This means that should something go seriously wrong, the managers concerned may be asked to account for their actions or omissions by their employer. It also means that a health and safety enforcement officer may want to talk to and investigate the managers who had responsibility for the work. Ultimately, the enforcement office could take legal action against those managers in the form of a criminal prosecution. Though prosecution of individual managers is very rare, it can and does happen.

One of the objectives of this IOSH Managing Safely course is to make you aware of the various responsibilities and accountabilities that you may have as a manager. In this way you will be able to recognise what you need to do to fulfil your responsibilities.

## CASE STUDY

A manager was fined a total of £10,000 after a 37-year-old worker suffered 90 per cent burns and died, when the aerosol canisters he was crushing caught fire.

The manager instructed the worker to crush the canisters in a metal baler. The canisters were full of an extremely flammable material but were not labelled. When the baler was activated, a canister caught fire, engulfing the worker in flames.

Two companies involved in the accident were also prosecuted and fined a total of £430,000 and ordered to pay £60,000 costs.

A manager inspects their work area to ensure good safety standards

# The Responsibility of Managers

It is not possible to produce a definitive list of generic responsibilities of managers, since many responsibilities will depend on the nature of the workplace/organisation and the position of the manager. For example, a workshop foreman will have different health and safety responsibilities than those of the senior manager of a private hospital.

We can, however, list some general management responsibilities that might be relevant.

For example, managers will usually be responsible for ensuring that:

- The organisation's health and safety policy is implemented in their working areas.
- Safe working practices exist for all work carried out by their staff and these are properly documented and adhered to.
- Appropriate safety equipment is supplied to their staff, properly maintained and used at all times.
- All their staff are adequately trained and competent to carry out the work allotted to them.
- No activities carried out by their staff will create a risk to other staff, visitors or the public.
- No work carried out by their contractors will place staff, visitors or the public at risk.
- Arrangements are made for accident reporting, first aid, fire precautions, etc. in their areas.
- All accidents and incidents that happen in their areas are properly investigated and preventive actions are implemented as required.
- All relevant legal records are made and kept.
- Where staff training needs are identified, that training is provided.

If you do not already have a list of your specific health and safety responsibilities, then this may be a matter to take up with your employer after this course.

## MORE...

For more information see the HSE website:

www.hse.gov.uk/managing/index.htm

## REVISION QUESTIONS

6. The employer is legally responsible for the health, safety and welfare of his employees. What does this mean for individual managers working for the employer?
7. Who might hold a manager to account for their actions or omissions with regards health and safety responsibilities?

(Suggested Answers are at the end.)

## SUMMARY

In Module 1, we have:

- Outlined the three main reasons for managing health and safety:
  - The **moral** reason - the moral duty that one person has to another. Many people are killed, injured or made sick by their work. This is morally unacceptable and society expects good standards of health and safety.
  - The **legal** reason - if an organisation is found to be breaking health and safety laws it can be subject to enforcement action and/or prosecution in the criminal courts.
  - The **financial** reason - accidents and ill health cost money. When an accident occurs there will be direct and indirect costs associated with that event. Some of these costs can be insured against; many of them will be uninsured.
- Outlined how managers have **responsibility** and **accountability** for the health and safety standards in the areas and for the staff under their control.

# RISK ASSESSMENT

MODULE 2

## LEARNING OUTCOMES

On completion of this module, you should be able to:

1. Define and give examples of hazards, hazardous events and risk using everyday and workplace activities.
2. Give examples of likelihood and consequence.
3. Outline the risk assessment process.
4. Identify the key considerations when carrying out risk assessment.
5. Demonstrate the use of a risk rating system using a 5×5 matrix.

# Contents

# An Introduction to Risk Assessment: Words, Phrases and Ideas

## KEY INFORMATION

- A **hazard** is something with the potential to cause harm.
- A **hazardous** event occurs when someone or something interacts with a hazard and allows it to cause harm.
- **Risk** is the likelihood of a hazardous event occurring in combination with the consequence of that event.
- **Risk assessment** is the simple process of identifying hazards, evaluating risks and identifying controls to avoid or minimise those risks.

In this section of the course we are going to look at the practical process of risk assessment. In order to do this there are some key words and phrases that we need to understand because they have quite specific meanings. If we don't define what we mean by these words and phrases, it is easy to get confused during the risk assessment process.

First though, it is perhaps worthwhile just thinking about the general idea of 'risk assessment'.

Risk assessment is a legal requirement in workplaces and has been for many years. We will look at some of these legal requirements later in the course. There are formalised processes for carrying out workplace risk assessments that we will study later in this module. But essentially, risk assessment is a simple process that we all do all of the time. We don't call it risk assessment, but we still do it. You are doing it as you read these words. - subconsciously.

- Are there any threats to my safety?
- If there are, what do I need to do about it?

Young children aren't very good at doing this, which is why we need to do it for them to keep them safe. As you grow up you learn to do this better. You learn how to cross the road safely. You learn how to drive a car safely. You learn how to work on a scaffold safely. This learning might come through education and training, or it might come through experience. Often it comes from a combination of both.

If you don't learn, then you get hurt.

## HAZARD

### GLOSSARY

**HAZARD**

Something with the potential to cause harm.

Everyday examples of hazards would include:

- A moving car on the road - if you are a pedestrian trying to cross that road.
- Electricity - running through the wires of your kettle or hairdryer.
- A sharp knife in the kitchen.
- The slippery floor of your bath or shower.
- An aggressive dog.
- Food poisoning bacteria - growing on a piece of chicken in a fridge.
- The oven cleaner - stored under the sink in the kitchen.
- Carrying the shopping out of the car and into your house.
- Kneeling on the floor banging nails into floorboards for three hours.

Lets break that definition down and focus on some of the key words: **something**, **potential** and **harm**.

As we can see from the above list, some hazards are physical things that could cause harm because of their physical nature. For example, a dog is a **physical** hazard that causes physical harm when it bites you.

But when you think about what some of the other '**somethings'** are in the above list, not all of the hazards are physical. The oven cleaner is a **chemical** hazard. The food poisoning bacteria are a **biological** hazard and carrying the shopping and kneeling on the floor are **activity** hazards. The first is an example of manual handling and the latter is an example of an ergonomic hazard.

Another key word to notice in the definition above is the word **potential**. When we identify a hazard, we are identifying something that has the potential to cause harm. Not necessarily something that will *definitely* cause harm - simply something that *could*, or *might* cause harm. A part of the risk assessment process is about trying to estimate how significant that potential for harm actually is.

Finally it is worth thinking about what we mean by the word **harm** in the definition above. Some of the above hazards are **safety hazards** and some are **health hazards**. What I mean by that is that some of these hazards have the potential to cause immediate physical injury, but some would cause a health problem instead. For example, a sharp kitchen knife causes immediate injury when you slip and cut your finger with it. But the food poisoning bacteria do not cause immediate injury, instead they cause sickness and diarrhoea 24 to 48 hours after you eat the contaminated piece of chicken. That's an ill-health effect. In this Managing Safely course we are concerned with preventing both injury and ill health, so both types of hazard need to be considered.

If we turn our attention to work, there are thousands of hazards that might exist in the workplace, depending on the nature of the workplace and the activities being carried out for work purposes.

Stop and think for a moment about the things with the potential to cause harm at work.

Typical examples of workplace hazards would include:

- Fire.
- Moving vehicles.
- Manual handling.
- Slip and trip hazards.
- Falling objects.
- Working at height.
- Noise.
- Chemicals.
- Biological agents.
- Electricity.

## HAZARDOUS EVENT

### GLOSSARY

**HAZARDOUS EVENT**

Occurs when someone or something interacts with a hazard and allows it to cause harm.

The moving car is a hazard but it does not cause harm until you step out in front of it and it hits you.

The slippery floor is a hazard but it does not cause harm until you walk across it and slip.

The corrosive chemical is a hazard but it does not cause harm until you spill it accidentally on your skin.

## RISK

### GLOSSARY

**RISK**

The likelihood of a hazardous event occurring in combination with the consequence of that event.

So risk is the combination of two factors:

- **Likelihood** – how likely is it that a particular hazardous event will occur and cause harm? You might call this the chance or probability.
- **Consequence** – what is the likely foreseeable harm? How bad would it be?

These two factors combine to give us the degree or level of risk. We might then identify the level of risk using words such as low risk or high risk.

For example, a responsible adult making a cup of tea might be described as a low risk activity since they are unlikely to spill boiling water on themselves and, if they did, it is likely to be of little consequence since they will know to run cold water over the scald immediately.

But a three-year-old child trying to do the same activity might be described as high risk, since they are far more likely to spill boiling water over themselves and if they did the consequences are likely to be very severe. They are likely to spill more water over themselves, they don't know how to treat scalds and they can't reach the cold tap even if they wanted to.

It doesn't bear thinking about.

Exactly the same ideas are used in the workplace when thinking about risk.

How likely is it that a member of staff will slip on the stairs after they have just been mopped by the cleaner at 9:30am? What are the likely foreseeable consequences?

Both likelihood and consequence will be influenced by a whole range of factors. For example, in the scenario just mentioned, factors that might influence likelihood include:

- Where are the stairs?
- How many members of staff use those stairs at that time of day?
- What is the surface of the stairs made of?
- Will the cleaner put warning signs up?
- Will members of staff be able to see the wet stairs and the warning signs?

Factors that might influence consequence include:

- Will staff be using the handrail?
- How many stairs might they fall down?
- The presence of vulnerable people who might be more severely injured by a fall on stairs (e.g. elderly people who have brittle bones).

In this scenario you can see that there will be a range of likelihoods from 'very unlikely' (e.g. if the stairs were rarely used and when used only by one member of staff) to 'very likely' (e.g. used by 200 staff every day at some time between 09:25am and 09:35am).

The range of consequences is wide ranging as well, from no injury at all to multiple broken bones. But here we have to take a realistic practical view and ask what the most likely foreseeable injury is.

## RISK ASSESSMENT

### GLOSSARY

**RISK ASSESSMENT**

The simple process of identifying hazards, evaluating risks and identifying controls to avoid or minimise those risks.

Risk assessments are a legal requirement under the **Management of Health and Safety at Work Regulations 1999**. These Regulations require that:

- a 'suitable and sufficient' risk assessment is carried out;
- the assessment is recorded if the employer has five or more employees; and
- the assessment is reviewed when necessary.

And in case you were wondering, a 'suitable and sufficient' risk assessment is one that:

- correctly identifies the significant hazards associated with the work;
- allows the employer to correctly identify the control measure that they need to introduce; and
- is appropriate to the nature of the work.

It is a key consideration of risk assessments that they are suitable and sufficient and that they are done with the involvement of workers. Those involved in the risk assessment process must have an appropriate level of knowledge and experience and, when evaluating risk, reference must be made to the relevant standards.

There are lots of other sets of health and safety regulations that also require risk assessment, but these are special risk assessments that tend to focus exclusively on one specific hazard only (e.g. noise assessment, hazardous substance assessment) and are beyond the scope of this course.

As well as being a legal requirement under the **Management of Health and Safety at Work Regulations 1999**, there are other benefits from carrying out risk assessment. For example, carrying out risk assessments allows you to:

- Comply with the law.
- Ensure that you have the right health and safety precautions in place.
- Avoid accidents and ill health and all of the costs that follow.
- Demonstrate to your staff that you are managing their health and safety.
- Demonstrate to your customers and clients that you are reputable.

# An Introduction to Risk Assessment: Words, Phrases and Ideas

Essentially risk assessment is a simple process. Workplace risk assessments tend to follow a formal procedure. In this course we will break risk assessment down into a six-step process:

1. List the work tasks
2. Identify the risks
3. Estimate the risks
4. Evaluate the risks
5. Record the findings
6. Review the findings

In the next part of this module we will consider each of these steps in detail.

## MORE...

The HSE have a part of their website dedicated to risk assessment:

www.hse.gov.uk/risk

## REVISION QUESTIONS

1. Define the word 'hazard'.
2. What is a 'hazardous event'?
3. What are the two main factors that are combined to give the degree or level of risk?
4. How many employees must an employer have before they must record their risk assessments by law?
5. What are the six steps of risk assessment?

(Suggested Answers are at the end.)

## KEY INFORMATION

- **Listing work tasks** involves considering all of the locations where work is carried out, the people in those areas, the equipment and substances present and the activities involved.
- **Identifying the risk** involves identifying all of the hazards and the people who might be harmed.
- **Estimating the risk** involves considering likelihood and consequence and can be done using a risk-rating matrix.
- **Evaluating the risk** involves making decisions about the acceptability of the risks identified.
- The **significant findings** of the risk assessment must be **recorded** (unless the employer has less than five employees).
- Risk assessment should be **reviewed** when things change, following incidents and periodically.

Risk assessment is a six step process:

1. **List the work tasks**
2. **Identify the risks**
3. **Estimate the risks**
4. **Evaluate the risks**
5. **Record the findings**
6. **Review the findings**

We will consider each of these steps in detail.

### LISTING THE WORK TASKS

When you are carrying out risk assessments you have to consider all of the work tasks that fall within your area of responsibility. This includes:

- **Locations** where work is carried out – such as main work areas, communal or shared areas and remote locations away from your workplace.
- **People** who might be present in these areas – such as your staff who will be in those locations all of the time or occasionally, contractors working in your workplace, visitors and members of the public.
- **Equipment and substances** that might be present in the workplace – such as plant, machinery, equipment, hand tools, chemicals and substances.
- **Activities** involved – which may be carried out routinely on a regular basis or may be carried out very infrequently.

Separate risk assessments may have to be completed to cover these different work locations, the use of different items of equipment or substances and different work activities.

It is essential to recognise that if a location, item, substance or activity is to do with work, then it needs to be covered by risk assessment.

An example **work task list** is given at the end of this module.

### IDENTIFYING THE RISKS

All of the hazards associated with work need to be identified.

As we discussed, a hazard is something with the potential to cause harm and this will include the physical, chemical and biological hazards that can cause direct injury or ill health.

For each hazard identified we also need to identify the groups of people who might be harmed by the hazard. This might include:

- Employees carrying out the work.
- Other employees who might be affected by the hazard.
- Contractors and temporary staff working in the workplace.
- Visitors to the workplace.
- Members of the public.

It is important to recognise that some of these groups of people may be affected by the hazard because they are in the workplace. Others may be affected by work activities even though they are not in the workplace.

For example:

- An electrical item of office equipment, such as a printer, presents the risk of electric shock to the worker who uses it.
- A cloud of dust generated in an engineering workshop presents a health risk to any person in the workshop who inhales it; workers, contractors and visitors.
- A toxic gas escape from a cannery presents a risk to everyone on site and the members of the public who live or work nearby or just happen to be walking by at the time.

An example **hazard checklist** is given at the end of this module.

## ESTIMATING THE RISKS

For each hazard identified, the level of risk generated need to be estimated.

As we discussed, risk is a combination of the likelihood of a hazardous event in combination with the consequence.

If each of these components is allocated a numerical value (a score) then risk can be rated by multiplying these scores together:

Risk = Likelihood × Consequence

For example:

| Likelihood | Consequence |
|---|---|
| 1 = very unlikely | 1 = insignificant - no injury |
| 2 = unlikely | 2 = minor - injury needing first aid |
| 3 = fairly unlikely | 3 = moderate - lost time injury |
| 4 = likely | 4 = major - hospital treatment |
| 5 = very likely | 5 = catastrophic - death or disabling injury |

Using this scoring system and the simple equation (Risk = Likelihood × Consequence) it is possible to rate the risk generated by each hazard.

For example:

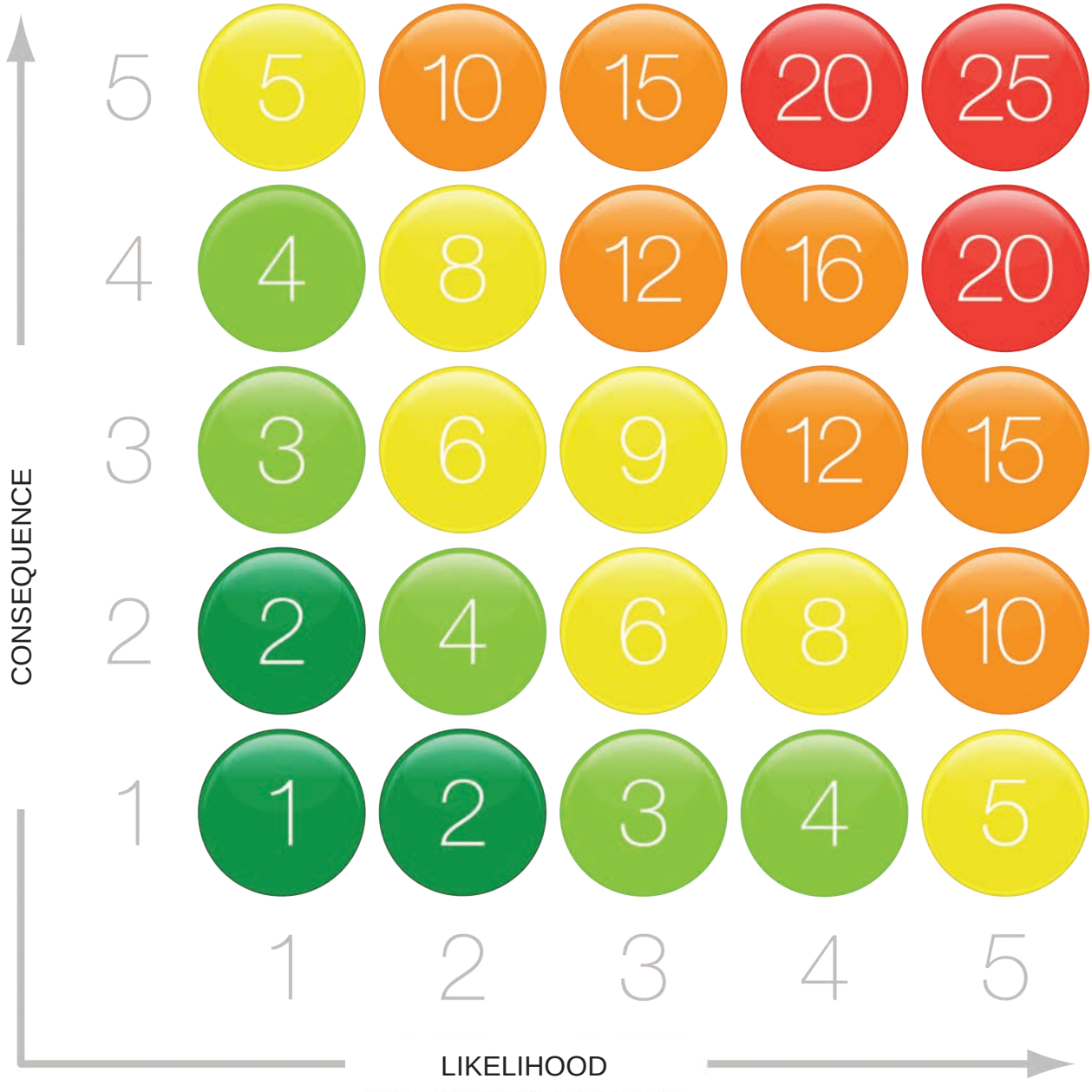
The risk generated by a trailing electrical flex positioned across a busy corridor might be calculated as:

***5*** (very likely) × **4** (hospital treatment) = **20**

The same electrical flex trailing on the floor close to the rear wall of a rarely visited plant room might be rated as:

**1** (very unlikely) × **4** (hospital treatment) = **4**

In this way it is possible to create a **risk-rating matrix** as illustrated in the following diagram. You will notice that this matrix has been colour coded using a traffic light system; green identifies a low risk, red identifies a high risk, and intermediate risks are shown in between.




A risk-rating matrix

One final point to note is that when estimating the risk level you should always take into account any of the existing precautions that already exist to control the risk.

For example, if estimating the risk presented by items of portable electrical equipment in an office, you might want to know when the items were last given a thorough examination and test by a competent person. If the answer was never, then you might suspect that the level of risk was high. But if you find out that the items are all inspected and tested at the correct frequency and that this was done recently by a suitably qualified competent person, then you might estimate the level of risk as being low.

## EVALUATING THE RISKS

Once the level of risk has been estimated we have to answer a simple question: is this level of risk acceptable?

If the level of risk is completely acceptable then no further action needs to be taken.

If, however, the level of risk is not acceptable then further action must be taken to reduce the risk to a more acceptable level. This is where the risk rating matrix can be very useful. It can be used to help decide:

- Which risks are more significant and which are less significant.
- The order of priority and timescale that risk should be addressed in.
- How effective any additional precautions and preventive measures will be.

For example, the following guidelines can be used:

| Risk Rating | Action and Timescale |
|---|---|
| 15 and above | **Unacceptable**.<br>Work may not start. Additional controls must be introduced to reduce risk rating to below 9. |
| 9 to 14 | **Tolerable**.<br>Additional controls must be introduced as soon as possible and no later than 24 hours after assessment. |
| 5 to 8 | **Tolerable**.<br>Must be reduced to below 5 within one week. |
| 4 or below | **Acceptable**.<br>If simple action can reduce further then it must be done within one week. |

Different organisations use different risk rating systems. The above is a typical example. But you should find out what sort of risk rating system your organisation uses so that you are familiar with its use.

## RECORDING YOUR FINDINGS

It is a legal requirement that risk assessments are recorded if the employer has five or more employees.

The exact way in which the risk assessment is recorded is not dictated by the law. Most risk assessments are recorded in written form, but some a recorded electronically.

What is important is that the significant findings of the assessment are recorded. These should include:

- Detail of the location, equipment, substances and activities being assessed.
- The hazard identified and the people who are exposed to them.
- The existing controls and the current risk level.
- Any additional controls required.
- The date and time of the assessment and the person carrying it out.
- A review date.

Many organisations have their own standard risk assessment record form.

An example **risk assessment record form** is given at the end of this module.

## REVIEWING YOUR FINDINGS

Risk assessments are not intended to be just pieces of paper that are locked away in a filing cabinet just in case an enforcement inspector ever comes to call.

They are intended to be live documents that reflect the real hazards, risk and controls present in a workplace.

They must be kept up to date and therefore it is essential that they are reviewed.

Risk assessments must be reviewed:

- After any significant change – such as a change in work activity, substances being used, equipment being used, etc.
- After any incident that might make you suspect that the assessment might not be valid, such as a near miss or accident.

It is good practice to review assessments periodically. In practice this may mean that assessments are reviewed every 6, 12 or 18 months. The time between reviews will depend on the level of risk and the nature of the workplace.

## REVISION QUESTIONS

6. List the types of groups of people that might be considered during the risk assessment process.
7. How can the level of risk be rated when estimating risk?
8. What must the employer do if during the risk evaluation step of the risk assessment they find that the level of risk is unacceptable?
9. What information must be recorded from the risk assessment?
10. When should a risk assessment be reviewed?

(Suggested Answers are at the end.)

## MORE...

The HSE have a part of their website dedicated to risk assessment:

www.hse.gov.uk/risk

# Summary

## SUMMARY

In Module 2, we have:

- Defined some of the key words, phrases and ideas associated with the practice of risk assessment:
  - A **hazard** - something with the potential to cause harm.
  - A **hazardous event** - when someone or something interacts with a hazard and allows it to cause harm.
  - **Risk** - the likelihood of a hazardous event occurring in combination with the consequence of that event.
  - **Risk assessment** - the simple process of identifying hazards, evaluating risks and identifying controls to avoid or minimise those risks.
- Examined the six steps of risk assessment:
  - **List the work tasks** - involves considering all of the locations where work is carried out, the people in those areas, the equipment and substances present and the activities involved.
  - **Identify the risks** - involves identifying all of the hazards and the people who might be harmed.
  - **Estimate the risks** - involves considering likelihood and consequence and can be done using a risk-rating matrix.
  - **Evaluate the risk** - involves making decisions about the acceptability of the risks identified.
  - **Record the assessment** - the significant findings must be recorded (unless the employer has fewer than 5 employees).
  - **Review the assessment** - when things change, following incidents and it is good practice to do so periodically.

# Work tasks list

Managing safely

| Company: | Department: | Location: |
|---|---|---|

| Locations | People | Equipment | Activities |
|---|---|---|---|
| | | | |

# Hazard checklist

Managing safely

| Company: | Department: | Site name: |
|---|---|---|

| Work activity | Description of the hazard | Number and occupation of people affected | Risk assessment recommended? |
|---|---|---|---|
| | | | ☐ Yes ☐ No |
| | | | ☐ Yes ☐ No |
| | | | ☐ Yes ☐ No |

# Risk assessment form

Managing safely

| Company: | Department: | Site name: |
|---|---|---|

| Work activity | Hazard, hazardous event and expected consequence | People affected | Assessment of risk: Likelihood level x Consequence level = Risk level | Are risk controls required? |
|---|---|---|---|---|
| | | Occupation:<br>Number: | | ☐ Yes ☐ No |
| | | Occupation:<br>Number: | | ☐ Yes ☐ No |
| | | Occupation:<br>Number: | | ☐ Yes ☐ No |



| Date: | Review period: | Date of next review: |
|---|---|---|

| Assessor's name: | Position: | Signature: |
|---|---|---|

# RISK CONTROL

MODULE 3

## LEARNING OUTCOMES

On completion of this module, you should be able to:

1. Outline the principal risk control options of reducing likelihood and/or consequence.
2. Explain the meaning of the term residual risk.
3. Describe the hierarchy of risk control options.
4. Outline the impact of human behaviour on the effectiveness of risk controls.
5. Define the phrase "so far as is reasonably practicable".

# Contents

## KEY INFORMATION

- Risk can be controlled by reducing the likelihood of a hazardous event, or reducing the consequences of the event, or both.
- Residual risk is the risk that remains after risk control options have been put in place.

In this section of the course we are going to look at the three main options that can be used to control risk. We will also consider that even when these options have been correctly used, there will always be an element of risk remaining.

A worker wearing a protective face visor

### REDUCING LIKELIHOOD AND CONSEQUENCE

You will remember from the last module that one of the key steps in the risk assessment process involves evaluating the risk. This means answering the question - is this level of risk acceptable?

If the level of risk is completely acceptable then no further action needs to be taken. If, however, the level of risk is unacceptable then further action must be taken to reduce the risk to a more acceptable level. This is risk control.

There are three main options for risk control:

- Reduce the likelihood of the hazardous event.
- Reduce the consequences of the hazardous event.
- Reduce both likelihood and consequence.

If you recall the risk rating matrix that was introduced in the Module 2, you will remember that:

**Risk = Likelihood × Consequence**

So a lower risk rating can be achieved by changing one or both of the starting numbers.

## Reducing Likelihood

This means introducing risk controls that make it less likely that a hazardous event will take place, for example:

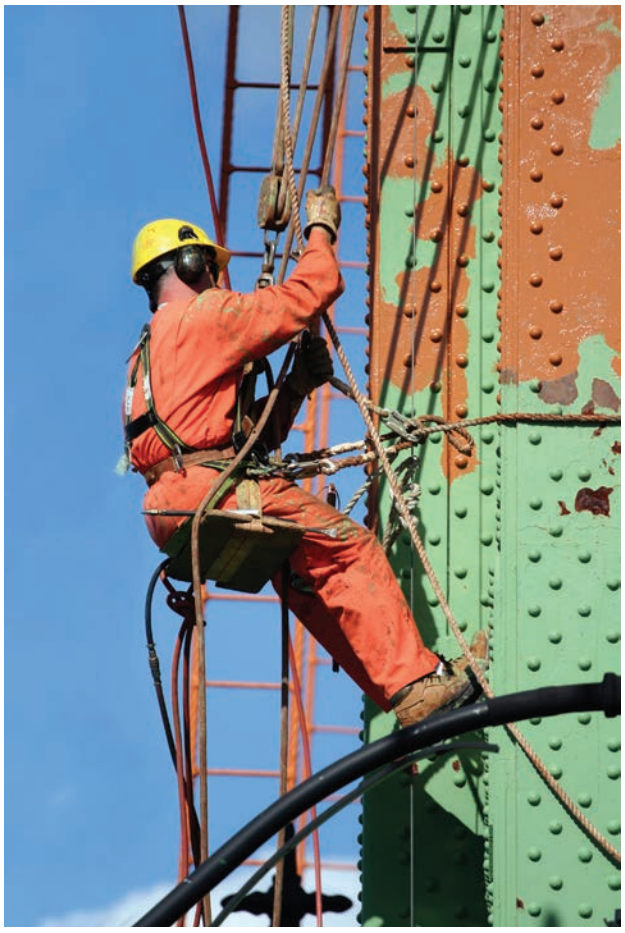
- Fit a guard to a dangerous moving part of machinery (such as a circular saw blade) so that it is less likely that anyone will come into contact with that dangerous part.
- Make a worker wear a face visor when handling a corrosive chemical, making it less likely that the chemical will splash in their eye.
- Warn people about a particular hazard (such as a slippery step) in the hope that they will then take extra care.

The limitation of reducing the likelihood is that it does not tackle the consequences. So if a person does interact with the hazard then they will still get hurt to the same degree.

## Reducing Consequence

This means introducing risk controls that make the outcome of the hazardous event less severe, for example:

- A steel erector working at height might wear a fall-arrest harness. This does not stop them from falling from height, but it does minimise the severity of their injuries if they do fall.
- Substitute a corrosive chemical with one that is classified as an irritant. Both chemicals are hazardous, but if one is spilt on the skin it will cause mild irritation rather than a chemical burn.
- Put a handrail on either side of the steps so that if people do slip they have something to hold on to to stop them hitting the floor.



A steel worker wearing a safety harness

The limitation of this approach is that it does not reduce the likelihood that a hazardous event will occur in the first place.

## Reducing Both Likelihood and Consequence

This approach combines the benefits of both of the previous options, for example:

- Replace an existing company car with a newer model on the basis that the newer model has a better braking system (e.g. Assisted Braking System (ABS)) and better in-built safety features, such as side-impact airbags. These safety features make it less likely that the car will be involved in a collision and may also reduce the severity of injury to the driver.

## RESIDUAL RISK

### GLOSSARY

**RESIDUAL RISK**

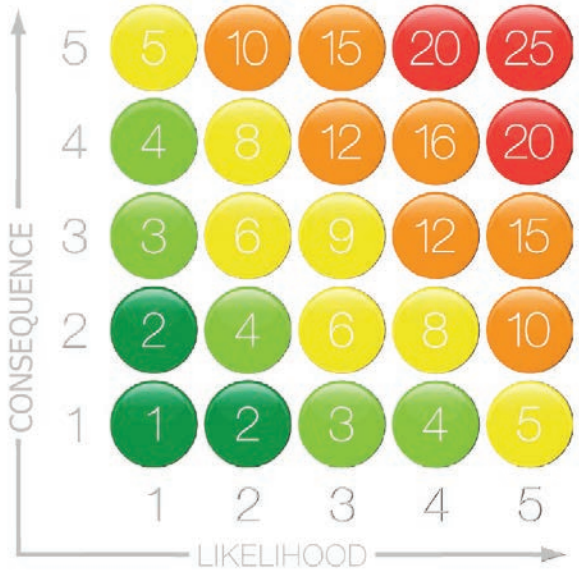
The risk that remains once you have implemented your chosen risk control option(s).

Whatever control option is selected, there will almost always be some risk remaining. Nothing at work (or in life in general) is completely risk free.

Obviously we want the residual risk to be as low as possible and we must ensure that any residual risk is acceptable. There is no point in implementing costly and time-consuming risk controls if they will not be effective in reducing the risk to an acceptable level.

The level of residual risk can be estimated using:

**Risk = Likelihood × Consequence**



To illustrate this idea we can consider a few of the examples given above:

- In the example of the guard fitted to a dangerous moving part of machinery (such as a circular saw blade):
  - The risk rating before the guard was fitted might be 3 × 4 = 12.
  - When the guard is fitted, the likelihood of the hazardous event might be reduced from 3 to 1.
  - The consequence stays the same at 4.
  - The risk rating with the guard fitted (the residual risk) is 1 × 4 = 4.
- In the example of the steel erector working at height without a fall-arrest harness:
  - The risk rating might be 3 × 5 = 15.
  - With the fall-arrest harness the risk rating might be 3 × 2 = 6.
- In the example of the existing company car:
  - The risk rating might be 3 × 5 = 15.
  - With a newer model the risk rating might be 2 × 4 = 8.

In each case a real reduction in the level of risk can be demonstrated. However, in each case some residual risk remains.

In the next part of this module we will look at the main factors which have to be considered when trying to decide which risk control option(s) to use.

## REVISION QUESTIONS

1. List the three main risk control options that can be used to reduce risk.
2. What is residual risk?

(Suggested Answers are at the end.)

# Deciding on Risk Control

## KEY INFORMATION

- When trying to decide which risk control option to use, a useful tool is the risk control hierarchy:
  - Eliminate the hazard.
  - Reduce the hazard.
  - Prevent people coming into contact with the hazard.
  - Safe systems of work.
  - Personal protective equipment.
- Any risk control option that relies on personal human behaviour is likely to be less reliable than a risk control option that does not.
- Reducing risks so far as is reasonably practicable means that the cost of the risk controls measured in **time,** money and effort has to be proportionate to the level of risk.

If risk assessment shows that a particular task or activity has an unacceptable level of risk associated with it, then some additional risk controls must be introduced to reduce the risk down to acceptable levels. In some cases there may be only one way to do this, but in many cases there may be a variety of different options available that reduce likelihood, consequence, or both. When making the decision about which particular risk control to use, there are several factors that should be considered:

- How effective will the risk control be in reducing the risk?
- What will the influence of human behaviour be on the effectiveness of the control?
- Will the risk be reduced to a level that meets legal requirements, i.e. down to **as low a level as is reasonably practicable**?

When answering the first of these questions, it's a good idea to make use of a list of control options called the **risk control hierarchy**.

## RISK CONTROL HIERARCHY

The risk control hierarchy is a list of five risk control options:

- Eliminate the hazard.
- Reduce the hazard.
- Prevent people coming into contact with the hazard.
- Safe systems of work.
- Personal protective equipment.

## GLOSSARY

### SAFE SYSTEM OF WORK

A formal procedure that sets out how an activity can be carried out so that risks are eliminated or controlled.

### PERSONAL PROTECTIVE EQUIPMENT

Equipment or clothing worn by a worker to protect them against one or more risks to their health and safety.

The options at the top of the list are the most effective and therefore are the preferred options. Those lower down the list are less effective because they tend to rely on individual personal behaviour. They are, therefore, more prone to human error and should be considered in combination with higher options or when the higher options are impractical or unrealistic.

In this way the list forms a hierarchy with the best risk control option at the top of the list and the less effective options at the bottom.

1. **Eliminate the hazard**

   The very best option would be to get rid of the hazard that gives rise to the risk in the first place. This might be done by changing a work activity, e.g. changing from wet-paint spraying to powder coating in order to eliminate the solvents used in the wet-paint spraying operation. Alternatively it might be done by automating or mechanising a process, e.g. mechanising the handling of sheets of laminate material in a workshop in order to eliminate the manual handling of those sheets.

   Eliminating the hazard goes right to the source of the problem – the thing that generates the risk in the first place.

2. **Reduce the hazard**

   If the hazard cannot be completely eliminated then it may be possible to reduce the hazard at source - the hazard will still remain but it will inherently generate less risk. This might be done by modifying the existing hazard, e.g. a large load might be split up into smaller loads for manual handling purposes. Alternatively one source of the hazard might be substituted with another that generates less risk, e.g. one hazardous chemical might be substituted with another that is less of a health risk. Likewise, a noisy item of plant or machinery might be substituted for another that does the same job but generates less noise.

3. **Prevent people coming into contact with the hazard**

   If the hazard itself cannot be eliminated or modified then it may be possible to separate people from the hazard in order to prevent contact. This might be done by placing the hazard in a very inaccessible location, e.g. high voltage power lines are sited on high pylons with barbed wire on the legs to prevent any person from coming into contact with the lines. Alternatively the hazard might be put under lock and key to prevent unauthorised access, e.g. flammable liquids might be stored in a locked compound that only authorised workers have the key to. Or the hazard might be enclosed in some form of enclosure to prevent contact, e.g. a guard on a dangerous moving part of machinery.

4. **Safe systems of work**

   A safe system of work is the set of procedures and rules that govern a particular work activity. This might include any permit-to-work systems that apply to the work activity. In some instances the safe system of work is a simple set of instructions for performing a task or operating a piece of equipment, e.g. the operating instructions for an office printer. In other instances a safe system of work is a complex set of rules and procedures developed to control high-risk work activities such as the maintenance of large, complex industrial plant. Safe systems of work are very reliant on personal behaviour; people have to do things the right way every time. It is therefore important that people are trained in the safe systems of work so that they can do their jobs safely.

5. **Personal protective equipment**

   Personal protective equipment is the equipment and clothing that a worker might wear to protect them from one or more risks to their health and safety, e.g. hard hats, goggles, hi-visibility jackets, safety boots and gloves. In some instances personal protective equipment must always be worn by the worker to ensure their safety during a particular work activity, e.g. a welder will always wear a head shield or visor to protect their face and eyes from harmful UV radiation given off during the welding process. In other instances personal protective equipment will only be worn in an emergency, e.g. chemical resistant gauntlets might only be used when cleaning up a spill of hazardous chemical following a leak.

## INFLUENCE OF HUMAN BEHAVIOUR

One of the reasons why control options at the top of the hierarchy are more reliable and controls options towards the bottom of the hierarchy are less effective is the influence of human behaviour.

Simply put, options at the top of the hierarchy are less reliant on personal human behaviour. Options at the bottom of the hierarchy are very reliant on personal human behaviour.

People are not robots. They do not behave perfectly all of the time. Sometimes people are prone to human error; they make mistakes and get things wrong even though they are trying to do the right thing. Other times they break the rules knowingly; people wilfully do things the wrong way because they want to.

Safe systems of work and personal protective equipment are particularly vulnerable to human error and wilful disobedience.

For example, if you give a worker who works in a high noise area some hearing protection (ear plugs or ear defenders) they may or may not wear them. Whether they wear them or not will depend on many factors such as:

- How well you have trained them.
- Whether they remember to carry them and put them on.
- How uncomfortable they are to wear.
- Whether or not they will get disciplined for not using them.
- Whether or not everyone else wears hearing protection (peer group pressure).

A worker in a high-noise area chooses to wear ear defenders

So the personal protective equipment risk control option is not perfect; its effectiveness is heavily influenced by personal human behaviour. If this risk control option is used then it will require significant management commitment to make it work properly. Management will have to provide the hearing protection and the training to ensure the worker understands how to use it correctly. Management will also have to supervise and enforce the use of the hearing protection. This takes time and effort.

If the noise source itself had been eliminated or substituted with one that produces less noise then the hearing protection option would not be necessary.

## SO FAR AS IS REASONABLY PRACTICABLE

The risk control hierarchy is a very useful tool to use when you are trying to decide which risk control options to implement during the risk assessment process. However, you also need to think about health and safety law and what the legal requirement for risk reduction is.

In most cases, health and safety law requires you to reduce risks **so far as is reasonably practicable**.

As we pointed out earlier in the course, there is no such thing as zero risk. There is risk associated with all activities in work and in life in general. Even looking at a computer screen you are being bombarded by invisible background radiation that carries with it a small but real health risk. Health and safety law does not, therefore, require you to create a risk free workplace because such a thing cannot exist. Instead the law usually requires you to reduce risks so far as is reasonably practicable.

This legal phrase means that you have to make a judgment of the level of risk and you have to balance that risk with proportionate risk controls. To do this you should consider the time, cost and difficulty of those risk controls.

Here are two extreme examples:

- The risk presented by paper cuts in an office is very small. Paper cuts happen occasionally but when they do they are of little consequence. You might therefore describe the risk as minor or trivial. Health and safety law does not require that any time, cost or effort has to be spent on controlling the risk of paper cuts in an office.
- The risk presented by explosive decompression in a deep sea diving operation is very high. Without proper controls, accidents would happen fairly often and when they did, people would die. You could not describe the risk as minor or trivial. Health and safety law requires that a lot of costly, time-consuming and difficult controls are put in place to reduce the risk to an acceptable level. Even with these controls in place some residual risk remains that is higher than the risk presented by paper cuts in an office.

These two extreme examples help to illustrate the principle behind the phrase "so far as is reasonably practicable". It is the idea that the level of risk has to be balanced against the cost in time, money and effort of the risk controls.

In most workplaces extreme examples do not exist and we find ourselves in the middle ground. There are some risks which are not extremely high or extremely low and we have to decide which risk control options are proportionate and which are not. This can be a difficult judgment to make - we want to comply with legal standards but we do not want to waste time, money and effort putting controls in place that are excessive and unnecessary.

One factor that should be taken into account when making this judgement is the level of risk estimated during the risk assessment and the risk reduction that might be achieved by putting different risk control options in place.

For example, controlling the risk of slips and trips on a construction site must be done so far as is reasonably practicable. This might be done by setting out designated pedestrian walkways; ensuring that these walkways are level and free of significant potholes; keeping them clear of debris and stored materials; and ensuring that they are adequately lit if the site is used during the hours of darkness.

Controlling the risk of slips and trips in a care home for the elderly must also be done so far as is reasonably practicable. It won't look like a construction site but all pedestrian walkways must still be kept very tidy and free of all slip and trip hazards. This is because the elderly are far less able to avoid slip and trip hazards and the consequences of a fall could be very severe.

In the examples given above, even though the same legal phrase is used in both workplaces, in practice it means a very different set of controls have to be adopted to ensure that the risk is controlled by proportionate means.


Illustration of 'reasonably practicable'

## CASE STUDY

A small electrical company sells electrical control systems for industrial workplaces. These control systems are built inside metal boxes. As part of the manufacturing process, the company cuts, folds, welds and paints these metal boxes so that the electrical control systems can be fitted inside. These are then shipped to the customer where they are installed.

One of the main hazards associated with the manufacture of the metal boxes is the paint spraying operation. This involves the use of isocyanate solvent-based paint. The isocyanate solvent can cause long-term and severe occupational asthma if the vapours are inhaled. It can also cause dermatitis on contact with the skin.

The company can apply the risk control hierarchy to the paint spraying operation in a number of ways:

**Eliminate the hazard**

- Buy the metal boxes pre-assembled and painted. The company would not have to manage any of the risks associated with the assembly and paint spraying operations. They could simply build their electrical control systems into the finished boxes.

Or

- Manufacture the metal boxes but send them to a specialist for paint spraying, then ship them back for the next stage of the process. The company would still have to manage the risks inherent in the manufacturing process but not the risks involved in the paint spraying operation itself.

**Reduce the hazard**

The company could find an alternative way of applying a durable finish to the metal boxes that would not involve the use of isocyanate solvents.

If the company decides to keep the isocyanate paint spraying operation, then:

**Prevent people coming into contact with the hazard**

- It must be enclosed in a spray booth that has an exhaust ventilation system built into it. This keeps the solvent vapours away from everyone except the individual doing the job – it also keeps that person away from the majority of the vapours.

**Safe system of work**

- A set of rules and procedures will have to be developed for the safe use, handling and storage of the solvents.

**Personal protective equipment**

- The worker in the spray booth will have to wear overalls, gloves and breathing apparatus to prevent skin contact and inhalation of the solvent or its vapours.

The company decides that the additional costs associated with outsourcing the work make the first two options unrealistic. After some investigation it also decides that substitution of the isocyanate paint is not possible because the quality and durability of the finish cannot be maintained.

The company therefore decides to retain the isocyanate paint spraying operation but must then implement all three of the remaining risk control options (a spray booth with extraction, safe systems of work and personal protective equipment) because the health risks from the isocyanate paint are so significant.

If you are trying to decide exactly how far to go in reducing risk so far as is reasonably practicable, the HSE produce a lot of guidance documents that can be very useful in identifying the recommended risk controls for a particular type of workplace or work activity.

## MORE...

HSE guidance documents are free to download from the HSE website:

www.hse.gov.uk

## REVISION QUESTIONS

3. List the five options in the risk control hierarchy in the correct order.
4. Why are control options at the top of the hierarchy preferable to those at the bottom of the hierarchy?
5. What does the phrase "so far as is reasonably practicable" mean?

(Suggested Answers are at the end.)

# Summary

## SUMMARY

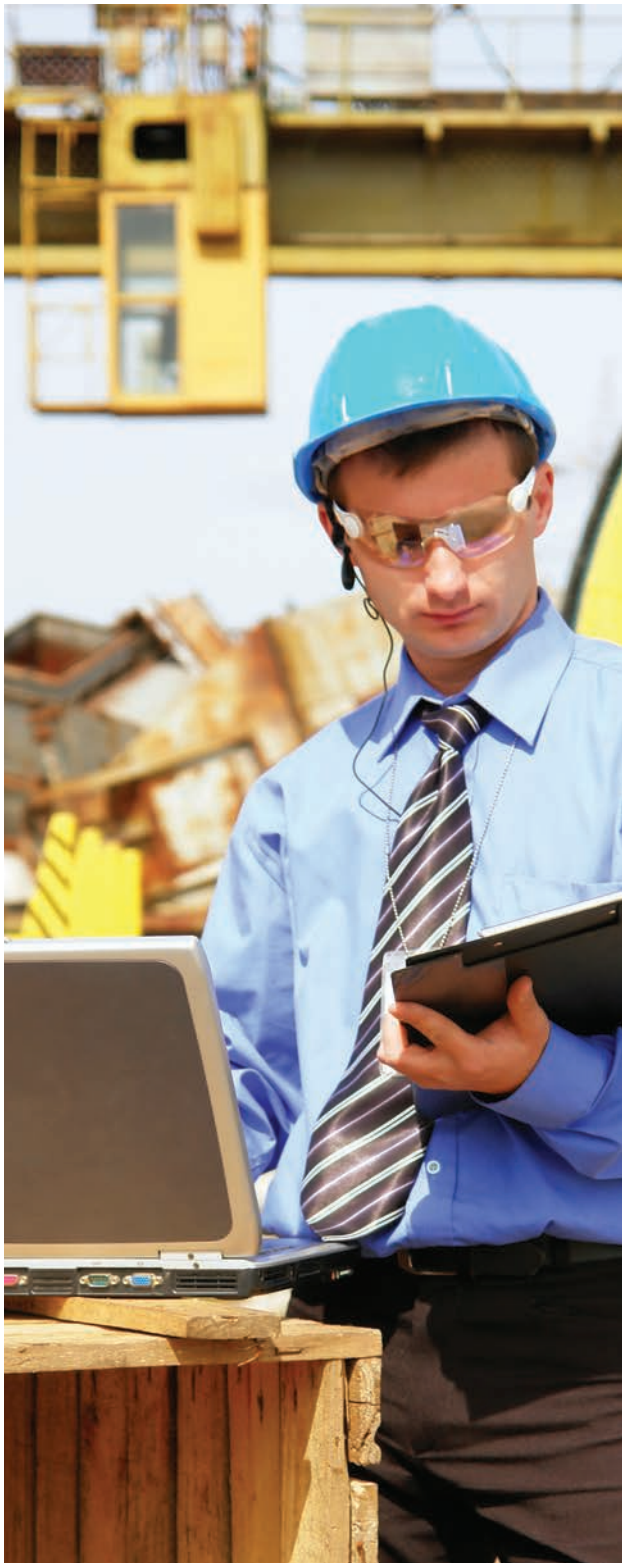
In Module 3, we have:

- Described how risk can be controlled by reducing the **likelihood** of a hazardous event, or reducing the **consequences** of the event, or both.
- Identified **residual risk** as the risk that remains after risk control options have been put into place.
- Introduced the **risk control hierarchy** as:
  - **eliminate** the hazard;
  - **reduce** the hazard;
  - **prevent** people coming into contact with the hazard;
  - **safe systems of work;**
  - **personal protective equipment;**

  and explained its use as a tool in selecting risk control options.
- Outlined how any risk control option that relies on personal **human behaviour** is likely to be less reliable than a risk control option that does not.
- Defined the legal term **so far as is reasonably practicable** as meaning that the cost of the risk controls measured in time, money and effort has to be proportionate to the level of risk.

# UNDERSTANDING YOUR RESPONSIBILITIES

MODULE 4



## LEARNING OUTCOMES

On completion of this module, you should be able to:

1. Explain the meaning of the term 'reasonably foreseeable' and outline the three tests for reasonable foreseeability.
2. Outline how the criminal legal system works and identify some of its key characteristics.
3. Outline how the civil legal system works and identify some of its key characteristics.
4. Outline the part that Approved Codes of Practice and Guidance play in the interpretation of legal standards.
5. Identify the enforcement notices available to an enforcement officer.
6. Outline the key elements of a health and safety management system.

# Contents

## KEY INFORMATION

- You are expected to be able to identify and manage reasonably foreseeable health and safety risks at work.
- There are three tests that can be used to determine whether a risk is reasonably foreseeable - common knowledge, industry knowledge and expert knowledge.
- In most workplace situations you are expected to identify and manage risks that require common knowledge and industry knowledge.
- If you are an expert then you are also expected to identify and manage risks that require expert knowledge.

A company or organisation is **not** expected to manage risks that could not have been identified or understood before the event. However, it **is** expected to identify and correctly manage the 'reasonably foreseeable' risks created by its work activities.

In the first part of this module we will examine the idea of reasonable foreseeability and identify the tests used to define it.

## MEANING OF THE TERM 'REASONABLY FORESEEABLE'

There have been many occasions when work activities have exposed people to risks that were unknown at the time. As knowledge and understanding have increased, these risks have come to be understood. Today we would describe the same risks as being **reasonably foreseeable**, but it would be unfair to look back in time and retrospectively apply this term.

For example, asbestos is known to be a cancer-causing mineral that is harmful if inhaled as a dust - the serious ill-health effects have been understood for decades. So, exposing a worker to asbestos dust today might be described as unacceptable because the risks are reasonably foreseeable. However, asbestos was not recognised as a harmful substance in the 1940s and 50s. Consequently the law would not have expected an employer to manage those risks – they were not considered reasonably foreseeable.

In the same way it would be quite reasonable for the law to punish an employer who exposed his workers to a risk that any reasonable person would identify and recognise as unacceptable. But that might not be the case where the risk was of a highly technical nature because it could then be described as beyond the knowledge and understanding of the employer (even if they were highly skilled and competent in their particular type of work).

For example, the law would punish an employer who put an untrained and unqualified worker at the controls of a high risk piece of machinery, such as a train. This is because any reasonable person would recognise that as a risk. However, the law might not punish an employer following the unpredictable failure of a piece of machinery which was being used correctly and for its intended purpose; particularly if that fault was very rare or previously unheard of in the industry in question.

Essentially, health and safety law requires you and your employer to manage reasonably foreseeable risks. In most cases these are the risks that would be recognised by a competent person working in your particular field. In a few cases these are also the risks that would only be recognised by a competent technical expert.

There are three tests that are helpful in determining whether a risk is reasonably foreseeable:

1. **Common knowledge** – if any reasonable person would identify the risk associated with the work then it is *reasonably foreseeable*, e.g. every reasonable person would recognise the risk associated with working on the sloping roof of a tall building.
2. **Industry knowledge** – if a particular risk is well-known and understood in your industry then it is *reasonably foreseeable*. For example, putting a worker into an unsupported deep trench dug into the ground is commonly recognised as a risk in the construction industry. The risk might not be recognised by a person who does not work in construction, but it is still considered reasonably foreseeable because workers and employers are expected to have a certain degree of industry knowledge.

3. **Expert knowledge** – if a risk is outside of the knowledge of most of the competent people working in a particular industry, then that risk might be described as not *reasonably foreseeable.* Only experts are expected to recognise such risks. For example, if a chemical is not classified as hazardous to health and is not generally recognised as harmful in a particular industry, then exposing a worker to health risks from such a chemical could be described as not reasonably foreseeable, even though there might be some research chemists who would disagree if asked for their expert opinion.

So you can see that, in most cases, you are expected to identify and manage reasonably foreseeable risks, i.e. those that would be recognised by a reasonable person and those that would be recognised by competent people working in your industry. In these cases, tests 1 and 2 would apply. You will rarely be expected to identify and manage risks that would only be recognised by experts - unless you are an expert! In which case, test 3 would also apply.

In the next part of this module we will look at the general legal framework that applies to health and safety.

## REVISION QUESTIONS

1. What does the term 'reasonably foreseeable' risk mean?
2. What are the three tests that can be applied to determine whether a risk is reasonably foreseeable?

(Suggested Answers are at the end.)

## KEY INFORMATION

- The **criminal legal system** is concerned with the punishment of organisations and individuals who break their obligations under statute health and safety law.
- Criminal prosecutions are carried out by the state through the criminal courts, with successful conviction leading to a fine (and/or imprisonment for an individual).
- The **civil legal system** is concerned with providing compensation for the victims of accidents who were not to blame for their own injuries or ill health.
- Civil proceedings are carried out by the injured victim through the civil courts, with success leading to a compensation payment from the employer to the worker.
- To win compensation the injured person has to prove that their employer has been negligent.
- There are three proofs or tests for negligence - duty of care owed, duty of care breached, loss as a direct result of the breach.
- Contributory negligence can be used to apportion some of the blame to the injured person themselves and so reduce the amount of compensation that they might win.
- Under the principle of vicarious liability an employer can be held vicariously liable for the negligent acts and omissions of his employees.
- Legal standards for health and safety are established by statute law, principally the **Health and Safety at Work, etc. Act 1974 (HSWA)** and Regulations made under the Act.
- The UK Health and Safety Executive (HSE) publish Approved Codes of Practice (ACoP) and Guidance on regulations to help employers understand their legal duties.
- Enforcement officers can issue two different types of enforcement notice when they see poor standards of health and safety in workplaces - improvement notices that require the employer to make an improvement to a deadline and prohibition notices that require the employer to stop a particular high-risk activity.

Two main types of law create a framework for the regulation of health and safety - criminal and civil law.

## CRIMINAL AND CIVIL LAW

Before examining each type of law it is worth outlining some general principles and characteristics of the legal framework.

The way that both types of law work is best illustrated using an example.

Imagine a scenario where a worker is run over by a forklift truck at work and suffers multiple broken bones.

The **criminal law** implications might be:

- The accident might be investigated by a Health and Safety Executive (HSE) Inspector. The HSE are an enforcing authority acting on behalf of the state. In some workplaces health and safety law is enforced by the Local Authority Environmental Health Officers instead.
- The inspector might decide to prosecute the company involved, for a breach of the **Health and Safety at Work, etc. Act 1974** or a breach of Regulations made under the Act. (Acts and Regulations are types of statute law that have been passed by Parliament.)
- To win the case the prosecution would have to show that the accused were guilty of the offence beyond reasonable doubt (i.e. there could be no doubt in the mind of a "reasonable" person that the accused is guilty).
- If the organisation were found guilty of an offence they would be fined. The fine cannot be reclaimed from an insurance company. This is the punishment for breaking the law. If an individual were found guilty of the offence then they would be fined and/or imprisoned.

The intention of the criminal legal system is to punish those who break the law. However, the criminal legal system does not necessarily help the injured worker. If the injured worker in this scenario wanted financial compensation for the injury, then they would have to turn to the civil legal system.

The **civil law** implications might be:

- The injured employee might sue their employer for compensation.
- To do this they would instruct a solicitor to act on their behalf. The letter of claim to the employer would have to be sent within three years of the date of the accident.

- In court the employee's legal team could use both common law and perhaps statute law to support their case. Common law is the law of the land that has been created by judges through the precedents that they set. This is different to statute law that is written in the form of Acts and Regulations passed by Parliament.
- The employee would need to show that their employer was negligent and is therefore liable for their injuries "on balance of probabilities" (i.e. it is more probable than not that the employer was negligent).
- If the employee won the case then the court would decide how much compensation should be paid. This compensation is paid from the employer's liability insurance policy.

The table below summarises the two types of law and shows some of the significant differences between the two.

| Criminal Law | Civil Law |
|---|---|
| Legal action is brought by **the state**. | Legal action is brought by **the individual**. |
| The intention is **punishment**. | The intention is **compensation**. |
| Legal proceedings are normally started within **6 months** of the offence coming to light. | Legal proceedings have to start within **3 years** of the date of the injury. |
| Insurance is **not available** to pay the fine. | **Insurance** is available to pay the compensation. |
| **Statute law** is used as the source of law. | **Common and statute** law are used as the sources of law. |
| The burden of proof normally required is "**guilt beyond reasonable doubt**". | The burden of proof required is "**on balance of probabilities**". |

There are, of course, many complications and technicalities that are not reflected in the scenario above. However, the above scenario and characteristics are useful as a general framework.

## Negligence

Negligence can be simply defined as a failure to take reasonable care when a duty of care exists.

If a person is injured or suffers some other form of loss as a result of someone else's negligence then they can use the civil legal system to claim compensation using the principle of **negligence**.

To demonstrate negligence the claimant must show that:

- a duty of care was owed to them by the defendant (the person or organisation that they are suing);
- the duty of care was breached;
- they suffered an injury or loss as a direct result of the breach of duty of care.

These are often referred to as the three proofs or tests for negligence. The claimant must prove their case on a balance of probabilities.

Let's examine each of these ideas in a little more detail:

- **The duty of care**

  The concept of a "duty of care" stems from case law. Essentially this is the idea that you owe a duty of care to the people who might be directly affected by your acts and omissions (according to what is reasonably foreseeable). For example, an employer owes his employees a duty of care when they are carrying out his work.

- **Breach of duty**

  Did the defendant act in a way that a reasonable person might be expected to act in the circumstances? Or did they omit to do something that a reasonable person might be expected to do in the circumstances? For example, a reasonable employer would cordon off a damaged stairwell and prevent its use; an unreasonable employer would leave it open and so breach the duty of care they have to their employees.

- **Injury as a direct result**

  The injury or loss must have arisen directly from the breach of duty of care. There must be a straightforward causal link from one to the other. For example, failure to cordon off the damaged stairwell (the breach of duty of care) leads to the collapse of the stairwell which, in turn, leads to an employee being injured.

Often the amount of compensation awarded to the injured worker is reduced as a result of **contributory negligence**. Contributory negligence is where a part of the blame for the injury is attributed to the worker. If they are partly to blame for their injury then they will lose some of their compensation payment. The proportion of their compensation payment that they lose will depend on how much of the blame they share for their own injury or ill health.

For example, imagine a scenario where a new starter is trained in the use of a piece of machinery and issued with items of Personal Protective Equipment (PPE), but is not supervised properly in the correct use of that machine. If they have an accident and try to claim compensation they will be able to argue that they were not supervised but their employer will be able to argue that they were trained and given the correct PPE to wear. The court might decide that the blame for the accident is split between the two parties. As a result the worker might get some of the compensation that they are seeking, but they might not receive the full amount as a result of their contributory negligence.

One final important idea under the heading of negligence is the principle of **vicarious liability**. Vicarious liability means that an employer can be held liable for the negligent acts (or omissions) of his employees when they are carrying out his work. So if an employee is negligent and injures another person at work then that injured person can claim compensation, through the civil legal system, from the employer (rather than having to sue the individual employee who actually caused their injury).

So, for example, when an untrained, unauthorised driver runs over a member of the public whilst trying to move a loaded pallet with a forklift truck, the injured member of the public can sue the employer of the driver for their injury. They do not have to sue the driver directly.

The principle behind vicarious liability is the idea that the employee was trying to carry out the work of their employer (however badly, incorrectly or incompetently) when the negligent act happened and the injury occurred. If the worker was not carrying out his employer's work when the negligent act occurred then vicarious liability might not apply; the employer would not be liable for any injury and the worker would have to pay compensation to the injured victim.

## The Health and Safety at Work, etc. Act 1974

The **Health and Safety at Work, etc. Act 1974 (HSWA)** is the principal piece of statute law regulating health and safety standards in workplaces.

The Act is written to be very general; it covers all workplaces and sets out general duties only. It does not provide any specific detail as to exactly how health and safety must be managed. The Act is often described as an **enabling Act** because it allows parliament to introduce regulations to regulate health and safety standards more specifically.

Health and safety regulations are made by parliament under **HSWA**. Regulations contain more specific requirements and provide more detail as to exactly how an employer will manage various health and safety issues. For example, the **Management of Health and Safety at Work Regulations 1999 (MHSWR)** state that an employer must carry out a suitable and sufficient assessment of the risks arising from his undertaking.

Regulations are often accompanied by **Approved Codes of Practice (ACoP)**. These Approved Codes have a special legal status. If an employer follows ACoP then they will be complying with the Regulations that these codes accompany. If the employer does not follow ACoP then they must do something that is at least as good or they will be failing to comply with the Regulations.

Regulations are also accompanied by **Guidance**. This is usually written by the HSE and sets out in plain English how to comply with the law. Guidance has no legal status but is very useful in interpreting health and safety law.

Enforcement of **HSWA** and its Regulations is carried out by HSE Inspectors and Environmental Health Officers (working for the Local Authority). There are two main enforcement tools used by inspectors when enforcing the Act:

- An **improvement notice** – this is a formal written notice that requires the employer to make some sort of improvement to a specific health and safety problem in their workplace. The notice is only issued when there is a clear breach of regulations that the inspector believes does not give rise to serious risk. The improvement notice does not prevent work from carrying on, but it does set a timescale for the required improvement to be implemented.

  For example, an inspector might issue an improvement notice where he or she finds that there are no risk assessments recorded in a workplace, but the work activities are not high risk. The inspector might allow the employer three months to carry out and implement their risk assessments.

- A **prohibition notice** – this is a formal written notice that requires the employer to stop a high risk work activity. The specific intention of the notice is to stop the work that the inspector believes is creating serious risk. No timescale is attached to the notice – the employer cannot re-start work until they have made it safe.

  For example, an inspector might issue a prohibition notice where they see a group of workers working on the sloping roof of a three-storey building with no precaution taken to prevent or control falls from height.

Of course the ultimate action that an inspector can take is to prosecute the employer or individual workers under **HSWA**. This would result in a criminal trial in a Magistrate's Court or Crown Court. Successful conviction would result in a fine for the employer and a fine and/or imprisonment for an individual.

## REVISION QUESTIONS

3. State three characteristics of the criminal legal system.
4. Under the civil legal system when does an injured victim have to start their claim for compensation?
5. What three things does the claimant have to show to be successful in proving negligence?
6. Explain the principle of contributory negligence.
7. What does the phrase "vicarious liability" mean?
8. Name the two different categories of statute law that govern health and safety standards at work.
9. Name the two other sources of information that can be used to understand and interpret legal standards.
10. What are the two types of enforcement notice called and what effect do they have?

(Suggested Answers are at the end.)

## KEY INFORMATION

- Health and safety must be managed systematically using some form of management system based on the "Plan, Do, Check, Act" model.
- One such management system is outlined in the HSE document, 'Managing for health and safety' (HSG65).

The management of workplace health and safety within an organisation must be considered systematically.

A systematic approach to management is often linked to the "PDCA cycle":

- Plan – plan what you are going to do.
- Do – do it.
- Check – check to see if it is working.
- Act – change things if it is not working properly.

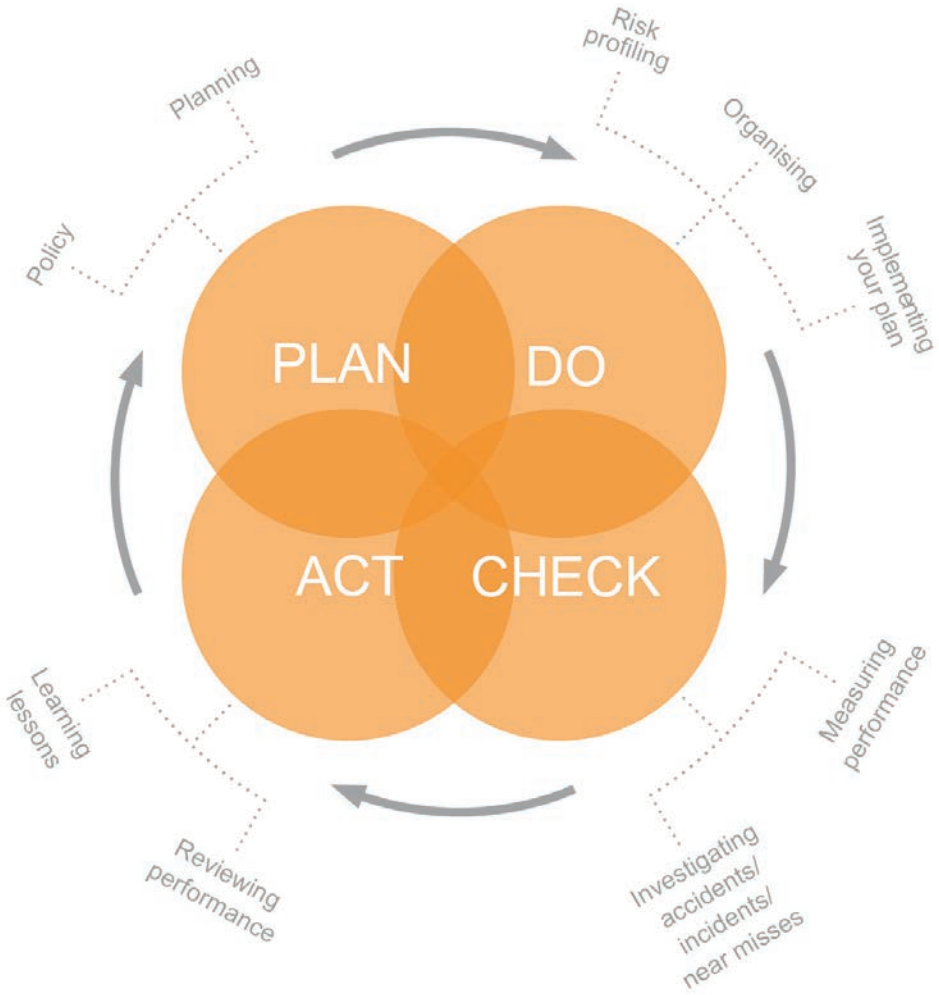
The Safety Management System (SMS) that is most frequently used by organisations to systematically manage health and safety is outlined in the HSE publication HSG65, '*Managing for health and safety*'.

## MORE...

HSE Guidance documents are free to download from the HSE website:

www.hse.gov.uk

The key elements of the HSG65 safety management system can be summarised using the following diagram. We will briefly consider each element in the rest of this section.



## PLAN

### Policy

Aside from being a legal requirement under the **Health and Safety at Work, etc. Act 1974**, if implemented well the policy should deliver the vision of the organisation for health and safety, together with the organisation to deliver it (who is doing what) and the methods by which it will be achieved (the arrangements that will be needed).

### Planning

This involves the systematic identification of risks within the organisation – not just the obvious safety issues but also the potential for longer-term harm resulting from ergonomic injuries, or occupational ill health.

At the planning stage organisations should also ensure that legal compliance is achieved or maintained by keeping abreast of new legislation and planning to implement additional steps, as required.

## DO

### Risk Profiling

We are all aware of the legal requirement to carry out risk assessments; however, HSG65 goes a step further and suggests that the most effective way to implement a health and safety management system is to ensure that someone senior within the organisation takes ownership of risk profiling and ensures the "nature and level of threat" to the business (not just of health and safety risks) is understood. This will enable action to be taken proportionate to the level of the risk to the business, and ensures that the business understands the potential impacts of the most significant risks.

Risk profiling will involve carrying out individual, task-based risk assessments in accordance with the **Management of Health and Safety at Work Regulations 1999**.

### Organising

The organising section of the management system references the "four Cs" – that is:

- **Control** – exercised throughout the business to ensure the safety of employees and contractors, with managers leading by example.
- **Co-operation** – employee involvement in health and safety to develop a culture of shared ownership.
- **Communication** – effective communication on health and safety matters as a two-way flow of information on key issues, including the findings of risk assessments and safe systems of work.
- **Competence** – the knowledge, skills and experience to fulfil the roles, as required.

This section therefore establishes a framework of roles and responsibilities for health and safety within the organisation, from senior management through to employees. Key roles such as safety advisers, first aiders, fire wardens, etc. will also be detailed within this section.

### Implementing

This section is concerned with implementing the controls identified in risk assessments, including:

- Preventive and protective measures.
- Tools and equipment.
- Training.
- Supervision.

This will require some level of resource, and managers must ensure that adequate resources are available (not only financial but time and people, as necessary).

HSG65 stresses here that paperwork should be "functional and concise", with the emphasis on effectiveness over sheer volume and controlling risks.

## CHECK

In this section of the PDCA cycle we are measuring to ensure that we are doing all of the things we set out to do.

### Measuring

Measures can be:

- **Active** – identifying problems before they occur – for example, health surveillance to detect warning signs, safety tours or inspections to identify hazards and deficiencies before people are injured.
- **Reactive** – learning from accidents, illnesses and injuries so they can be prevented from recurring.

### Investigating Accidents and Incidents

Near misses, as well as accident and incidents, should be investigated as, while this is clearly a reactive measure, it shows that you are managing health and safety and learning from events. If action is taken to prevent recurrence this can aid the development of a positive health and safety culture and boost morale. Accidents will also need to be reported (in some cases) in accordance with legal requirements under RIDDOR.

## ACT

### Reviewing Performance

This section is concerned with reviewing health and safety performance to determine if we are heading in the right direction.

The review is critical as it closes the loop – taking facts and data from monitoring and checking progress against the targets. For this reason, reviews should be carried out on a regular basis (according to the risk profile).

### Learning Lessons

Lessons should be learned from events such as accidents and audits. As part of this review consideration should be given to the part played by human factors – for example, errors and violations.

### The Benefits of implementing a Safety Management System

There are many benefits to implementing a safety management system, such as HSG65. These benefits include:

- Helps compliance with legislative and other requirements.
- Assists organisations to deliver the policy.
- Enables improved management of health and safety risks.
- Provides competitive edge.
- Provides synergy with good business management.
- Protection of company assets.
- Creates a positive health and safety culture.
- Improves communication within the organisation.

**REVISION QUESTION**

11. Name the key parts of the health and safety management system published by the HSE in HSG65: *Managing for Health and Safety.*

(Suggested Answer is at the end.)

# Summary

## SUMMARY

In Module 4, we have:

- Explained that you are expected to be able to identify and manage **reasonably foreseeable** risks.
- Identified the **three tests** that can be used to identify if a risk is reasonably foreseeable - **common** knowledge, **industry** knowledge and **expert** knowledge.
- Explained the key characteristics and differences between the **criminal** and **civil** legal systems - criminal law is concerned with the **punishment** of breaches of statute law by the state in the form of fines and/or imprisonment; civil law is concerned with **compensation** for the victims of accidents that were caused by someone else's negligence.
- Outlined the **three proofs** or tests for **negligence** - duty of care owed, duty of care breached, loss as a direct result of the breach.
- Explained the civil law principle of **contributory negligence**; where the compensation paid to the claimant is reduced because they are partly to blame for their own injuries.
- Explained the civil law principle of **vicarious liability**; where the employer is held to be liable for the negligent acts of his employees.
- Described how legal standards for health and safety are established by statute law, principally the **Health and Safety at Work, etc. Act 1974** and Regulations made under the Act.
- Described how **Approved Codes of Practice (ACoP)** and **Guidance** can be used to help understand legal requirements.
- Outlined the two different types of **enforcement notice** that can be used to enforce health and safety law - improvement notices that require the employer to make an improvement to a deadline and prohibition notices that require the employer to stop a particular high-risk activity.
- Identified that health and safety must be managed systematically using some form of **safety management system** based on the **Plan, Do, Check, Act** management cycle.
- Explained the HSG65 safety management system published by the HSE.

# IDENTIFYING HAZARDS

MODULE 5


## LEARNING OUTCOMES

On completion of this module, you should be able to:

1. Outline information on a range of common workplace hazards such as:
   - Chemicals
   - Display Screen Equipment
   - Electricity
   - Fire
   - Manual Handling
   - Movement of People
   - Noise
   - Stress
   - Temperature
   - Vehicles
   - Vibration
   - Violence
   - Welfare
   - Work at Height
2. Identify the key arrangements required for the effective management of each of these common workplace hazards.

# Contents

# Contents

# An Introduction to Common Workplace Hazards

Every workplace will have a range of hazards present and these will be dependent on the nature of the workplace and the types of work activity undertaken, e.g. a hairdressing salon will present a very different range of hazards than a metal workshop. However, some hazards will be shared by most workplaces, such as electricity, slips, trips and falls and manual handling.

In this section of the course we will look at a range of common workplace hazards. For each hazard we will examine a little background detail and then consider the key arrangements that should be in place to effectively manage the hazard.

## KEY INFORMATION

- Chemicals are classified as toxic, harmful, corrosive or irritant according to their hazardous properties.
- Chemicals can enter the body by inhalation, ingestion, absorption and injection, and may have acute (short-term), or chronic (long-term) effects.
- Any work with chemicals must be risk assessed to ensure that appropriate precautions are put in place.
- Exposure to hazardous chemicals can be controlled using a 'hierarchy of controls': eliminate or substitute the substances; change the process; reduce the exposure time; enclose or segregate; local exhaust ventilation; dilution ventilation; personal protective equipment; and personal hygiene.

Exposure to hazardous chemicals can cause an immediate health risk (e.g. carbon monoxide gas can cause asphyxiation) or even physical injury (e.g. corrosive skin burn from sulphuric acid). Exposure can also have long-term health effects, which may build gradually over time (e.g. lead poisoning) and in some instances will not be apparent until years after the exposure (e.g. lung cancer caused by exposure to asbestos).

### CLASSIFICATION OF CHEMICALS

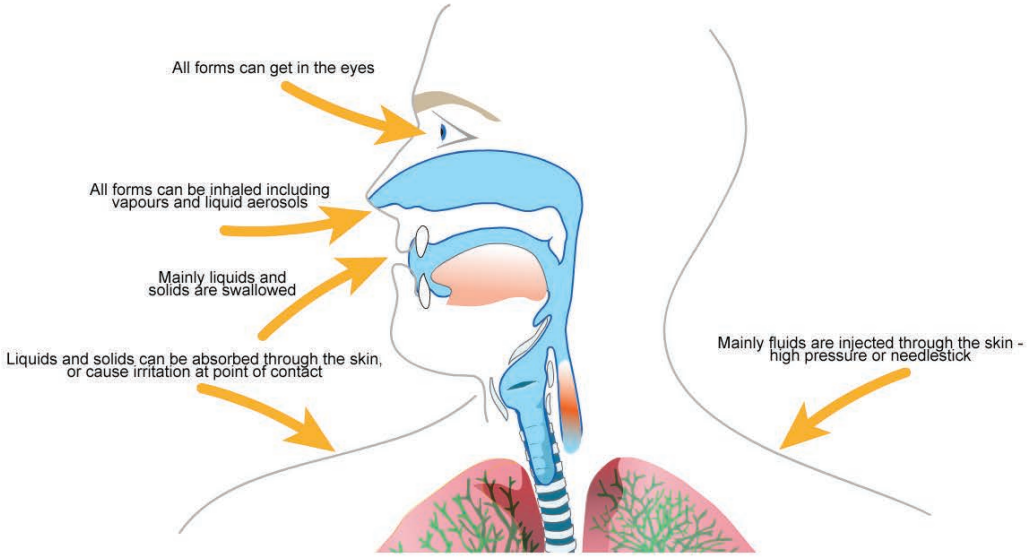
Chemicals are classified according to their health effects. The main classifications are:

- **Toxic** – small doses cause death or serious ill health when inhaled, swallowed or absorbed via the skin (e.g. potassium cyanide).
- **Harmful** – large doses cause death or serious ill health when inhaled, swallowed or absorbed via the skin.
- **Corrosive** – destroys living tissue on contact (e.g. concentrated sodium hydroxide).
- **Irritant** – causes inflammation of the skin or mucous membranes (e.g. eyes and lungs) through immediate, prolonged or repeated contact (e.g. ozone).

### ROUTES OF ENTRY

There are four main routes of entry for hazardous substances into the body:

- **Inhalation** – the substance is breathed in through the nose and mouth and down into the lungs. This is a significant route of entry for many hazardous substances in gas, vapour, mist, fume or dust form.
- **Ingestion** – the substance is taken in through the mouth and swallowed down into the stomach, it then moves on through the digestive system.
- **Absorption through the skin** – the substance passes through the skin and into the tissues beneath and then into the bloodstream. Only some substances (e.g. organic solvents) are able to permeate the skin in this way.
- **Injection through the skin** – the substance passes through the skin barrier either by physical injection (e.g. a needle-stick injury) or through damaged skin (cuts and grazes).




## HEALTH EFFECTS OF CHEMICALS

When a person is exposed to a hazardous chemical two different types of effect can occur:

- **Acute effects** – (short-term effects) as a result of exposure to high levels of the substance, sometimes over very short periods of time, e.g. exposure to high concentrations of chlorine gas causes immediate irritation to the respiratory system.
- **Chronic effects** – (long-term effects) as a result of exposure to much lower levels of the substance over long periods of time. These usually occur weeks, months or years after exposure began, e.g. lung tissue scarring (asbestosis) occurs 10-20 years after multiple exposures to asbestos.

Note that many hazardous substances can have acute **and** chronic effects. For example, exposure to high concentrations of organic solvent can have an almost immediate narcotic effect (acute) whilst long-term repeated exposure to much lower levels can cause liver damage (chronic).

## COSHH RISK ASSESSMENT

Where workers might potentially be exposed to hazardous substances through the course of their work, it is necessary to assess that potential to ensure that harm does not occur. This is a legal requirement under the **Control of Substances Hazardous to Health Regulations 2002 (COSHH)**.

The general steps of a **COSHH** risk assessment are:

1. Identify the hazardous substances present and the people who might potentially be exposed.
2. Gather information about the substance.
3. Evaluate the health risk.
4. Identify any controls needed and implement them.
5. Record the assessment and action taken.
6. Review.

When identifying the hazardous substances present in the workplace, you need to consider those that come pre-packaged and labelled, as well as those that might be **created** by work processes. For example, welding metal creates a metal fume and mixing bleach and acid together can create chlorine gas.

Information about the nature of the hazardous substance can be obtained from many different sources, but two of the most commonly used sources are the product label and the Manufacturer's Safety Data Sheet (MSDS).

## CONTROLLING EXPOSURE TO CHEMICALS

Preventing exposure to hazardous substances is the most effective way of controlling the health risk that they present. Where exposure cannot be prevented then it should be controlled. It is possible to apply a hierarchy of controls to substances hazardous to health.

### Elimination or Substitution

It may be possible to eliminate or substitute the substance by:

- Eliminating the process or type of work that requires the use of the substance (e.g. outsourcing a paint-spraying operation).
- Substituting the hazardous substance for a non-hazardous alternative (e.g. switching from an irritant to a non-hazardous floor cleaner).

## Process Change

It may be possible to change the process so as to reduce the risks associated with the substance. For example, vacuuming rather than sweeping keeps dust levels down.

## Reduce Exposure Times

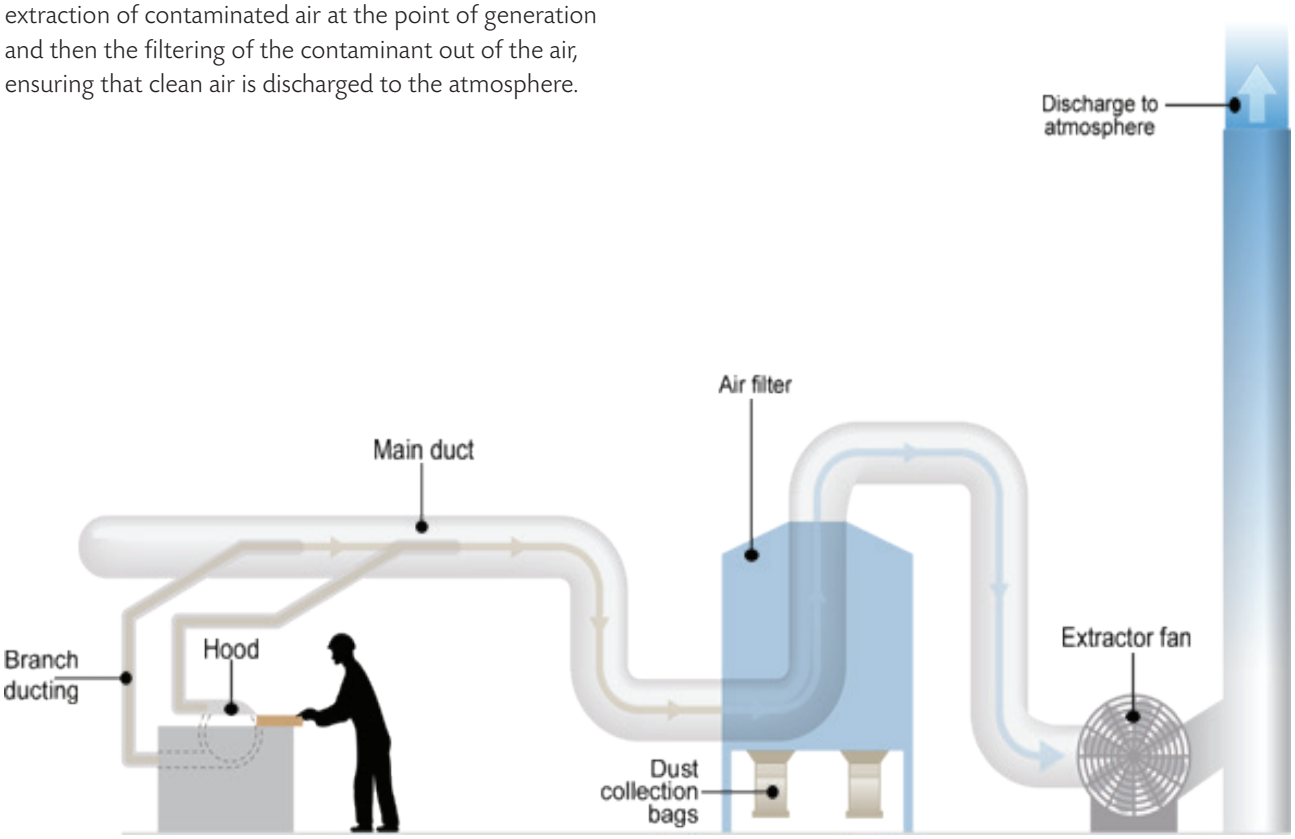
There is a simple relationship between the length of time a person is exposed to a hazardous substance and the dose of substance that they receive - double the time, double the dose; halve the time, halve the dose. It is therefore sensible to minimise the time period over which people are working with hazardous substances, especially where the hazardous substance can have an acute effect.

## Enclosure and Segregation

It may be necessary to totally enclose the hazardous substance inside process machinery, storage tanks, etc. on a small or large scale. Segregating the hazardous substance in the workplace may also be a possibility; it might be stored in a segregated storage area and used in an area away from other work processes and unauthorised personnel.

## Local Exhaust Ventilation

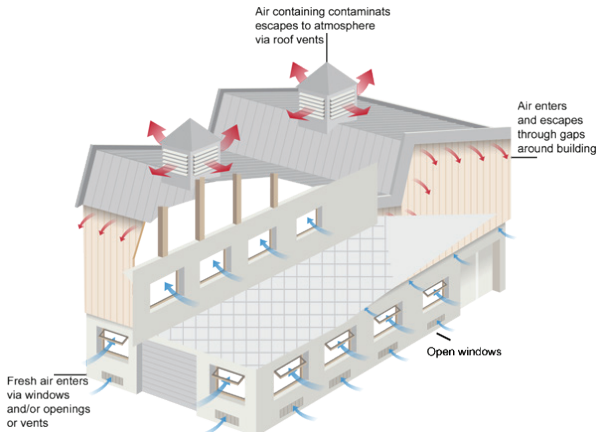
One common control for substances that might become airborne is the use of Local Exhaust Ventilation (LEV) systems. A wide variety of different types of LEV are available but the basic principle of an LEV system is the extraction of contaminated air at the point of generation and then the filtering of the contaminant out of the air, ensuring that clean air is discharged to the atmosphere.




A typical LEV system extracting sawdust from a bench-mounted circular saw

## Dilution Ventilation

Dilution ventilation operates by diluting the contaminant concentration in the general atmosphere to an acceptable level by changing the air efficiently in the workplace over a period of time, e.g. number of complete changes every hour.




Passive dilution ventilation

## Personal Protective Equipment

Personal Protective Equipment (PPE) is often used as a control measure when dealing with hazardous substances. This can include respiratory protective equipment (e.g. a respirator), hand protection (e.g. gloves), eye and face protection (e.g. goggles) and whole body protection (e.g. an apron).

## Personal Hygiene

Personal hygiene is often essential to prevent exposure to hazardous substances. Many hazardous chemicals are put on to the skin or into the mouth by cross-contamination. For example, a construction worker's hands become contaminated with a chemical, they then touch their nose or mouth and the chemical has direct access.

It is essential that good hygiene practices are adopted, as appropriate:

- Hand-washing when leaving work-rooms.
- Careful removal and disposal of potentially contaminated PPE to prevent cross-contamination to normal clothes.
- Prohibition of eating, drinking and smoking in work areas.

This will require the provision of appropriate washing facilities (water, soap and drying equipment), changing facilities, and food preparation and eating areas.

### REVISION QUESTIONS

1. What are the four main routes of entry for hazardous chemicals into the body?
2. What is the first step in managing the risk associated with chemicals?
3. Why is personal hygiene important when people are working with chemicals?

(Suggested Answers are at the end.)

## KEY INFORMATION

- Display Screen Equipment (DSE) use can cause Work-Related Upper Limb Disorders (WRULDs), back pain and eye strain.
- Precautions for safe use of DSE include: ergonomic assessment of the workstation; provision of basic equipment; short, frequent breaks; eye tests; and the provision of information and training.

## DISPLAY SCREEN EQUIPMENT: RISKS

Use of Display Screen Equipment (DSE) or computers and keyboards is a common workplace activity which has several associated ill-health issues:

- **Work-Related Upper Limb Disorders (WRULDs)** – associated with repetitive use of the keyboard and mouse for long periods of time.

## GLOSSARY

### WORK-RELATED UPPER LIMB DISORDERS (WRULDS)

A collection of conditions that affect the arms and hands (e.g. carpal tunnel syndrome). Early symptoms include tingling sensations, numbness and discomfort; these then progress to more severe pain and immobility. WRULDs are often referred to as Repetitive Strain Injuries (RSIs).

- **Eye strain** – temporary eye fatigue associated with prolonged use of the screen.
- **Back pain** – associated with sitting in a fixed position, perhaps with poor posture, for long periods of time.
- **Fatigue and stress** – associated with the type of work being done, e.g. call centre staff may be subjected to verbal abuse during telephone calls.

These health effects can occur when using desktop computers but are becoming increasingly common in association with the use of laptops when they are used for long-duration work.

The portability of laptops allows them to be used in a casual manner that is inappropriate for long-duration use

## DISPLAY SCREEN EQUIPMENT: CONTROL MEASURES

Control measures appropriate for DSE use include:

- Carry out an ergonomic assessment of the user's workstation to ensure that the equipment and environment meet minimum standards and that the workstation can be adjusted to suit the user.
- Provide basic DSE workstation equipment that meets minimum standards in terms of good ergonomic design.
- Plan the user's work routine so that they can take short, frequent breaks from screen and keyboard use.
- Provide DSE users with a free eye test and, if required, glasses for screen use.
- Provide information and training to users on the potential health risks of DSE use and the preventive measures, particularly ergonomic use of the workstation.

These measures are a legal requirement under the **Health and Safety (Display Screen Equipment) Regulations 1992**.

Some of the good practices with regards to posture and workstation use are illustrated in the following figure.


Good ergonomics at a DSE workstation

The numbered issues are as follows:

1. Adjustable height and angle to seat back.
2. Good lumbar support.
3. Adjustable height seat to bring the hands to a comfortable position on the keyboard. Seat also has a stable 5-star base.
4. Correct seat height adjustment and keeping the feet supported prevents excess pressure on underside of thighs and backs of knees.
5. Foot support if user cannot get their feet on the floor.
6. Space for postural change, no obstacles under desk; this allows the user to change position.
7. Forearms approximately horizontal when hands are on keyboard.
8. Wrists straight and flat when on the keyboard indicating proper seat height adjustment.
9. Screen height and tilt should be adjustable so as to allow comfortable head position.
10. Space in front of keyboard to support hands/wrists during pauses in typing; a wrist-rest can provide further support if required.

## REVISION QUESTIONS

4. What are the main health risks associated with the use of DSE?
5. What are the basic characteristics of a chair suitable for DSE use?

(Suggested Answers are at the end.)

## KEY INFORMATION

- The hazards of electricity are electric shock, burns, fire and explosion, arcing, and secondary effects.
- Electrical equipment must be suitable for its intended purpose and the environment in which it will be used.
- Protection methods and devices for electricity include fuses, earthing, isolation, low voltage equipment, residual current devices and double insulation.
- Portable electrical equipment should be subject to inspections and testing to ensure safety.

## HAZARDS OF ELECTRICITY

- **Electric shock** - when a person receives an electric shock they can suffer a range of effects, from mild discomfort and muscle tremor through uncontrollable muscle contractions and respiratory failure, to ventricular fibrillation, cardiac arrest and severe burns.
- **Burns** - caused by the direct passage of electricity through the body, or by proximity to arcing or exposed electrical equipment.
- **Fire and explosion** - caused by faulty, misused or poorly maintained equipment.
- **Arcing** - where electrical current jumps across an air gap. This hazard is particularly significant for high-voltage electrical systems.
- **Secondary effects** - injuries often occur when workers fall from height or are thrown away from equipment during electric shock accidents.

Accidents involving electricity frequently involve two or more of these hazards at the same time.

## CONTROL MEASURES FOR ELECTRICITY

### Selection and Suitability

Electrical equipment must be carefully selected to ensure that it is suitable for the task and the environment in which it will be used.

### Fuses and Miniature Circuit Breakers

A fuse is a device used to prevent current overload. A simple fuse contains a thin piece of fuse wire. If the current is too great for the fuse rating then the wire becomes hot and melts. This breaks the circuit. Fuses primarily protect equipment and not people. Miniature circuit breakers are electromechanical devices that work in a similar way to fuses to protect equipment from current overload.

### Earthing

Earthing is a way of protecting equipment so that, in the event of an electrical fault, current flows safely to earth rather than flowing through a person who might be touching the equipment.

### Isolation

Isolation is the removal of power from a circuit. This might be achieved using a switch (isolator) or by pulling the plug out. To ensure safety, isolation should be physically secured before people work on the dead system. This is often achieved by padlocking isolators in the off position.

### Low Voltage Systems

The lower the voltage that an electrical system is operated at, the lower the risk of injury associated with electric shock. The use of 110 volts for portable power tools is standard practice on construction sites.

### Residual Current Devices

A residual current device is specifically designed to protect human life in the event of electric shock. It does so on the basis that it is very sensitive to small current imbalance in a circuit and is able to break the circuit very quickly.

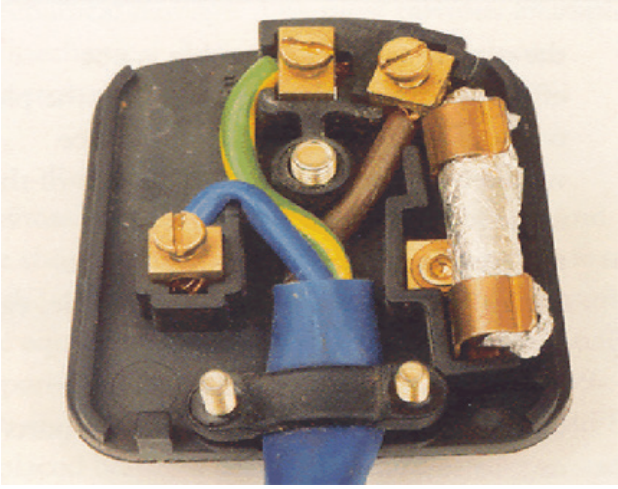
### Double Insulation

The principle behind double insulation is exactly as suggested: there are two layers of insulation between the user and any live conductors. Double insulation is commonly used for hand-held portable electrical equipment such as hedge trimmers.

## Inspection and Maintenance

Portable electrical appliances should be routinely inspected and tested. This is usually referred to as PAT testing (portable appliance testing). The frequency at which a portable electrical appliance should be PAT tested will vary depending on the type of equipment and how and where it is used. If inspection shows that the equipment is unsafe, then it must be taken out of use and be repaired or discarded.

Formal inspection and testing should uncover unsafe conditions, as shown in the following picture of a fuse which has been disabled by wrapping it in tin-foil.



Formal inspection should uncover unsafe conditions, such as this fuse, which has been disabled by wrapping it in tin-foil.
Source: HSG107 Maintaining portable and transportable electrical equipment (2nd ed.), HSE, 2004

## Competent Persons

Work on any sort of electrical equipment must only be carried out by competent persons, that is to say people with the right level of knowledge, ability, training and experience.

### REVISION QUESTIONS

6. What are the main hazards of electricity?
7. How does an electrical fuse work?
8. What type of person can carry out work on electrical equipment and systems at work?

(Suggested Answers are at the end.)

## KEY INFORMATION

- Three things must be present for a fire to start: fuel, oxygen and heat.
- Common causes of fire are faulty or misused electric equipment, deliberate ignition, hot works, heating and cooking appliances, and smoking materials.
- Fire can be prevented by controlling fuel and ignition sources.
- Arrangements must be put in place to deal with fires. These include fire alarm systems, evacuation routes, emergency procedures and fire-fighting equipment.

## BASIC PRINCIPLES

The basic principles of fire can be represented by the fire triangle, as shown in the following diagram.


The fire triangle

For fire to exist three things must be present:

- **Fuel** – a combustible material or substance (such as paper, wood or petrol).
- **Oxygen** – consumed during combustion. Oxygen is present in air.
- **Heat** – a heat or ignition source is essential to start the combustion process.

Once a fire has started it will produce heat, flames and smoke. Most deaths caused by fires are as a result of smoke inhalation.

The fire triangle is useful for two reasons:

- Fire prevention – keep the three elements apart and a fire cannot start.
- Fire-fighting – remove one of the elements and the fire will go out.

## COMMON CAUSES OF WORKPLACE FIRE

Some of the most common causes of workplace fires are:

- Electrical equipment – faulty wiring, overloaded conductors, misused equipment and the incorrect use of electrical equipment in inappropriate environments.
- Deliberate ignition – many workplace fires are started deliberately.
- Hot work – any work involving the use of naked flames (e.g. a propane torch) or that creates a significant ignition source (e.g. arc-welding).
- Smoking – in particular carelessly discarded smoking materials such as cigarette butts and matches.
- Cooking appliances, e.g. fat pans left unattended.
- Heating appliances, e.g. electric fan heaters left unattended.
- Unsafe use and storage of flammable liquids and gases, e.g. petrol, acetone and Liquefied Petroleum Gas (LPG).

Unsafe storage of gas cylinders

- Mechanical heat – generated by friction between moving parts such as a motor and its bearings.

## FIRE RISK ASSESSMENT

The **Regulatory Reform (Fire Safety Order) 2005** requires that a fire risk assessment is carried out. The general principles of fire risk assessment are similar to the steps of general risk assessment:

- Identify the fire hazards.
- Identify the people who might be harmed.
- Identify the fire precautions that are required.
- Implement precautions and record.
- Review.

## FIRE PRECAUTIONS

A range of preventive and precautionary measures will be necessary for fire safety in your workplace. The exact precautions needed for the workplace will, of course, vary but the following issues should be addressed.

### Fire Prevention

Fire can be prevented by controlling potential fuel sources. Risk from fuel sources can be managed by elimination, substitution, minimising quantities and by safe use and storage.

Fire can also be prevented by controlling potential ignition sources such as electrical equipment, hot work, discarded smoking materials, and cooking and heating appliances. Safe systems of work can be used to control work activities involving fire risk, e.g. permit-to-work systems can be used to manage the risk associated with hot work. Good standards of housekeeping are essential to minimise the quantities of flammables (such as waste packaging) in the workplace and their proximity to ignition sources. Flammable liquids and gases must be used and stored with appropriate care to minimise the associated fire risk.

### Prevention of the Spread of Smoke and Flames

If a fire starts on the ground floor of a large, open-plan multi-storey building that has open stairwells, convection will drive the hot smoke from the fire upwards. It will then rise up the stairwells and fill the upper storeys. The fire will spread through the building. Any people in the building will be trapped and die as a result of fire and smoke inhalation.

If, however, the building is compartmentalised, when the fire starts on the ground floor it will be contained in one part of the building. This will give time for the fire to be detected, the alarm raised and the building evacuated.

Building compartmentation is only fully effective if any openings in the compartment walls are sealed. Fire doors in particular, which are built to withstand the spread of smoke and flames, must be kept closed.

### Fire Alarm Systems

Fire alarm systems allow for the early detection of fire and warning for occupants. These systems must, therefore, be maintained in a good working condition. Alarms must be promptly responded to by all staff.

### Escape Routes

There should be an accessible escape route available to every person in a workplace, whether they are in an office, workroom, plant room, basement or on the roof. People should not have to use machinery (such as a passenger lift) except in special cases (when the machinery must be specifically designed and built for escape purposes). The escape route must take a person from wherever they are in the workplace to a place of safety outside the building where they are able to move away. The escape route should be clearly signed and appropriately lit. Emergency lighting should be provided where necessary (in case the mains power supply fails). Escape routes must be kept clear of obstructions such as stored material or inappropriate doors.

### Fire-Fighting Equipment

Various types of portable fire extinguisher are commonly found in workplaces:

- Water.
- Carbon dioxide.
- Foam.
- Dry powder.
- Wet chemical.

Fire extinguishers are usually coloured red, sometimes with a coloured label for quick identification of the type. They should be positioned on fire exit routes near exit doors and close to the specific hazard that they are provided to protect against (e.g. a fire blanket close to a gas hob in a kitchen). They should be clearly visible and signed.

Fire extinguishers must also be inspected and routinely maintained to ensure that they are in good working order.

Workers who might have to use portable fire extinguishers must be trained in safe use. This training should include theoretical and practical elements. Fire blankets may also be supplied to physically smother small fires. These are very useful for cooking areas where fat fires might occur and also for smothering burning clothing.

## Emergency Procedures

Every workplace should have arrangements in place to deal with fire emergencies. These arrangements should include:

- Evacuation procedures.
- Nominating responsible staff to fulfil roles such as fire marshals.
- Training for staff.
- The provision of information to visitors and members of the public.
- Fire drills to test procedures.

The best course of action on discovering a fire is to sound the alarm and evacuate the building. Delays in evacuation can cost lives.

### REVISION QUESTIONS

9. What is the fire triangle?
10. How can the fire triangle be used in fire prevention?
11. Name three types of fire extinguisher.

(Suggested Answers are at the end.)

# Manual Handling

## KEY INFORMATION

- Manual handling is a common cause of injury to the back, tendons, ligaments and muscles as well as WRULDs.
- Manual handling can be assessed by looking at four main factors: the task, the load, the environment, and individual capabilities.
- The risk associated with manual handling can be controlled by automating or mechanising the handling; using handling aids; modifying the task, load or environment; and by ensuring individual capabilities are matched to the activity.

## COMMON TYPES OF MANUAL HANDLING INJURY

### GLOSSARY

#### MANUAL HANDLING

The lifting, carrying, pushing and pulling of a load by bodily force. It can involve very repetitive movements of relatively small loads (e.g. handling small components on a production line) or it can involve one-off movements of very large and heavy items (e.g. handling structural steels into position in an inaccessible location).

All manual handling activities generate the possibility of injuries, most of which are musculoskeletal injuries. Common types of manual handling injury include:

- **Back injury** - the spine is made up of individual bones (vertebrae) separated by tough pads (intervertebral discs). Wear and tear can occur to these discs so that they become distorted (slipped disc). This causes extreme pain and discomfort and is often accompanied by nerve pain because the distorted disc traps nerves where they enter the spinal cord. This type of injury is perhaps the most serious of all manual handling injuries since recovery is often slow, incomplete and in some instances the victim will have to undergo surgery to repair the defect or may end up permanently disabled.
- **Tendon and ligament injuries** – when tendons and ligaments are overloaded they can tear causing extremely painful injuries which can take a long time to heal. In some instances recovery is incomplete and an operation may be required.
- **Muscle injuries** – overloaded muscle tissue can tear. This is painful and likely to lead to short-term impairment.
- **Hernias** – when the sheet muscle that surrounds the gut is overloaded it can distort and tear. This usually happens in the lower abdomen and can be a painful injury that will not repair naturally. In many instances an operation is required.
- **Work Related Upper Limb Disorders (WRULDs)** – chronic soft-tissue injuries to the arms, wrists and hands as a result of repetitive movements.
- **Cuts, burns and broken bones** – physical injury may result if the load is hot, sharp or dropped on to the feet.

Worker with back injury

## ASSESSING MANUAL HANDLING RISKS

The **Manual Handling Operations Regulations 1992** state that when a manual handling activity cannot be completely eliminated then it must be assessed. This risk assessment will be slightly different from the general risk assessment you are already familiar with because it focuses exclusively on the hazard of manual handling and ignores all other hazards.

Manual handling risk assessment focuses on **four** main factors:

- The task.
- The individual.
- The load.
- The environment.

### The Task

The focus here is on the movements required of the worker as they handle the load.

The task can be assessed by asking questions such as *at what height is the load being picked up, carried or put down?*

Task risk factors can increase the risk associated with the task. For example, picking up a load at waist height, carrying it a short distance and putting it down at waist height is a simple task that does not complicate the risk associated with the handling. However, picking up the same load from floor height (risk factor 1) from the bottom of a box that requires the worker to stoop down into the box (risk factor 2) then carrying the load at arms' length (risk factor 3) for a distance of 15 metres (risk factor 4) and putting it down above head height (risk factor 5) increases the risk associated with the task very significantly.

Holding a load away from your torso when lifting increases the risk of injury

### The Individual

The focus here is on the worker carrying out the handling activity. Relevant questions would be:

- Does the activity require unusual ability, such as unusual strength, stamina or technique?
- Does the activity present significant risk to vulnerable individuals such as pregnant women or people with pre-existing back injuries?

### The Load

Here the focus is the load that is being handled. Though the load is usually an inanimate object, in some workplaces it may be an animal or a person, e.g. in a hospital, patients have to be moved.

The load can be assessed by asking questions such as *how heavy is the load?*

For example, the risk associated with handling a concrete block of 12kg is lower than that associated with handling a bundle of flexible plastic pipes each 3 metres long that weighs 12kg.

### The Environment

The focus here is the environment in which the handling takes place.

The environment can be assessed by asking questions such as *is the floor surface slippery or uneven?*

For example, handling activities carried out outdoors on a poorly lit construction site in freezing conditions when there is ice on the ground will be higher risk than similar activities carried out indoors in a warm, well-lit area.

### Minimising the Risks

Control of manual handling risk can be achieved by using a simple hierarchy of controls:

- Eliminate the manual handling.
- Assess the manual handling that cannot be eliminated.
- Use handling aids.
- Modify the task, load or environment.
- Ensure individual capabilities are matched to the activity.

### REVISION QUESTIONS

12. What is manual handling?
13. What are the four main factors that have to be assessed during a manual handling risk assessment?

(Suggested Answers are at the end.)

# Movement of People

## KEY INFORMATION

- Pedestrians are exposed to various hazards as they move around the workplace. These hazards can cause slips, trips and falls; falls from height; collisions with moving vehicles; striking by moving, flying or falling objects; striking against fixed or stationary objects.
- These hazards can be controlled through the risk assessment process and by careful design and construction of the workplace. Key controls are non-slip surfaces, good drainage, designating pedestrian walkways, using signs and PPE, and routine inspection and maintenance of control measures.

When people move around in workplaces they are exposed to a range of hazards simply by being pedestrians. These hazards can be categorised by the type of accident that they cause:

- **Slips, Trips and Falls on the Same Level**

  For example, slipping on a smooth surface that is wet because of a cleaning operation. Of all workplace accident types, slips, trips and falls cause the greatest number of broken bones.

- **Falls from Height**

  For example, using a step ladder. Falls from height (even a low height) often cause very serious injury and are the most common cause of fatal injury.

- **Collisions with Moving Vehicles**

  For example, a pedestrian walkway that requires pedestrians to walk in a vehicle traffic route (e.g. in a warehouse or car park). Accidents resulting from these types of hazard are again often the cause of serious or fatal injury.

- **Striking by Moving, Flying or Falling Objects**

  For example, a load falling from height during a lifting and handling operation (e.g. boxes falling from a pallet when being lifted by a forklift truck).

  Although people are not injured by falling objects as often as they are by vehicles and falls from height, the injuries received could still be serious or fatal.

- **Striking Against Fixed or Stationary Objects**

  For example, objects that project into a pedestrian area or route (e.g. stored stock metal sheets that partly project into a walkway).

## CONTROL STRATEGIES

The control strategies for managing the risk inherent in the movement of people in a workplace are based on basic health and safety management principles:

- Eliminate the hazard.
- Create a safe place.
- Create a safe person.

The starting point is risk assessment. During this risk assessment it is important to consider the:

- Normal patterns of movement in and around the workplace.
- Predictable abnormal movements (e.g. taking short-cuts; fire evacuations).
- Accident history of the workplace that might indicate problem areas.
- Impact of adverse weather conditions (e.g. ice and rain).

All floor surfaces where people may walk should be designed to ensure an appropriate level of slip-resistance. If this is not done during construction, then slip-resistant surfaces may have to be fitted or applied at a later stage.

The use of correct footwear can be important in reducing the risk of slips and trips in the workplace.

Floors and pedestrian routes should be constructed with appropriate drainage.

Designated walkways can be used to try to ensure that:

- Pedestrians stay within designated areas.
- Vehicles or other hazards do not stray into pedestrian areas.

Walkways might be designated by:

- Guard rails - this provides direct physical protection.
- Kerbs and pavements - such as outdoors, adjacent to a vehicle road.
- Markings on the floor.

Clearly visible and easily understood signs and markings should be provided so that pedestrians are made aware of hazards and what they must do to avoid them. Signs should conform to legal standards (see below):

- Prohibition, e.g. no pedestrian access.
- Warning, e.g. forklift trucks operating in this area.
- Mandatory, e.g. high-visibility PPE must be worn.
- Safe conditions, e.g. fire escape route.

PPE may be necessary to protect pedestrians from various hazards as they move about the workplace. High visibility (hi viz) clothing, such as coats and tabards can be particularly important where vehicles are moving.

Thought must be given to the maintenance of a safe workplace:

- Floors and walkways should be cleaned routinely to ensure they are kept free of contamination.
- Spills will have to be cleaned up quickly and safely.
- Housekeeping routines should be established to ensure that pedestrian routes are free of obstructions. This is particularly important for emergency exit routes.
- Lighting should be routinely inspected and replaced/ repaired as necessary.

## SAFETY SIGNS

Safety signs combine shape, colour and pictograms to convey specific health and safety information or instructions.

The **Health and Safety (Safety Signs and Signals) Regulations 1996** divide safety signs into five categories:

- **Prohibition** - directed at stopping dangerous behaviour, e.g. "No Smoking".

- **Warning** - tell people to be careful of a particular hazard, e.g. "Forklift Trucks Operating In The Area".

- **Mandatory** action - instruct people to take a specific action, often relating to wearing PPE, e.g. "Eye Protection Must Be Worn".

- **Safe condition** - identify safe behaviour or places of safety, e.g. "First-Aid Station".

- **Fire-fighting equipment** - identify particular items of equipment, e.g. "Hose Reels".

## REVISION QUESTIONS

14. What type of accident is responsible for the greatest number of broken bones?
15. What shape and colour is a mandatory sign?

(Suggested Answers are at the end.)

# Noise

## KEY INFORMATION

- Exposure to excessive noise causes Noise-Induced Hearing Loss (NIHL) as well as other health and safety risks.
- Noise exposure should be assessed by a competent person.
- Control of exposure to noise can be achieved by eliminating or modifying the source of the noise, interrupting the pathway of the noise and issuing hearing protection (ear defenders and ear plugs) to workers.

Noise is a significant health hazard in many workplaces.

Worker using noisy machinery wearing ear defenders

## EFFECTS OF EXPOSURE TO NOISE

There are many health and safety issues associated with noise in the workplace such as:

- Noise-Induced Hearing Loss (NIHL) – permanent loss of hearing as a result of repeated exposure to excessively loud noise.
- Tinnitus – persistent ringing in the ears as a result of repeated exposure to excessively loud noise.
- Stress effects caused by irritating nuisance/background noise.
- Inability to hear hazards (such as vehicles), alarms and spoken instructions.

## NOISE EXPOSURE STANDARDS

Under the **Control of Noise at Work Regulations 2005**, if employees are exposed to a daily personal noise dose of 80 decibels, then their employer must:

- Carry out a noise assessment.
- Provide information, instruction and training.
- Make hearing protection available.

And if employees are exposed to a daily personal noise dose of **85 decibels**, then their employer must:

- Carry out a noise assessment.
- Reduce noise exposure to the lowest level reasonably practicable.
- Establish mandatory hearing protection zones.
- Provide information, instruction and training to employees.
- Provide hearing protection and enforce its use.
- Provide health surveillance.

**Noise assessments** are usually only required where there is likely to be significant exposure to noise. If a noise assessment is needed then some form of noise survey will have to be carried out. The results of a noise survey need to be interpreted to give an accurate estimate of workers' exposures. These exposures can then be compared to relevant standards and any necessary action identified.

Noise measurement and assessment is a complex topic that should only be undertaken by a competent person.

## NOISE EXPOSURE CONTROL

In simple terms noise exposure can be controlled in three ways:

- Reduce the noise at source.
- Interrupt the pathway from source to receiver.
- Protect the receiver.

**Hearing protection** should be used as a last resort when other control options are not reasonably practicable.

The two principal types of hearing protection are:

- Ear defenders or muffs – encase the outer ear in a cup with some sort of foam or gel-filled cushion to seal against the side of the head.
- Ear plugs – fit into the ear canal.

Whichever type of hearing protection is chosen, arrangements should be made for:

- Information, instruction and training on use, cleaning, maintenance and replacement.
- Safe storage in hygienic locations.
- Cleaning, maintenance and replacement.

Health surveillance in the form of hearing tests is a legal requirement for all workers potentially exposed at or above the 85 decibel level.

## REVISION QUESTIONS

16. What are the main health and safety risks associated with exposure to loud noise?
17. What is the first thing that an employer must do when workers are exposed to excessive noise levels?
18. What are the two different types of hearing protection?

(Suggested Answers are at the end.)

# Stress

## KEY INFORMATION

- Stress is an adverse reaction to excessive pressure. If prolonged, it can cause various psychological, physical and behavioural effects and ill health.
- Stress can be caused by unreasonable demands; lack of control; lack of support; poor working relationships; an ill-defined role; and change.
- To minimise the risk of stress the employer should establish a management framework for demands, control, support, relationships, role and change.

Excessive workload can be a cause of stress

## GLOSSARY

### STRESS

Adverse reaction that people have to excessive pressure or other demands placed upon them.

Pressure is an inherent part of work, whether it is a deadline that must not be missed or a rate of output that must be maintained. Pressure does not necessarily lead to stress because in many circumstances people are able to cope with the pressure they are under. In fact, in many situations pressure results in a positive performance, e.g. athletes tend to produce their very best performances under the pressure of competition.

However, in some instances a person finds themselves unable to cope with the pressure that they are under. This leads to anxiety, which then creates a negative reaction, rather than a positive one. If the pressure is short-term then there will be little consequence for the person other than a few sleepless nights. But if the pressure continues or increases, then the relatively minor symptoms of stress can escalate into psychological illness and physical ill health.

## CAUSES OF STRESS

We can look at the causes of workplace stress under six headings:

- **Demands** – excessive demands of the job in terms of workload (too much or too little), deadlines, working hours (excessively long) and patterns (e.g. shift patterns).
- **Control** – lack of control over work, how it is to be done, the priorities involved and even simple things like control over the working environment.
- **Support** – lack of support in terms of information, instruction and training to do the work and having no-one to turn to when pressure increases.
- **Relationships** – poor workplace relationships and in particular bullying and harassment.
- **Role** – lack of clarity about an individual's role, what responsibilities and authority they have, and how they fit in to the larger organisational structure.
- **Change** – the threat of change and the anxiety and insecurity that can accompany change.

## EFFECTS OF STRESS

Stress can have many effects, some of which will depend on the individual concerned. These effects can be classified as:

- **Psychological** - anxiety, low self-esteem, depression.
- **Physical** - sweating, fast heart beat, high blood pressure, skin rashes, muscle tension, headache, dizziness.
- **Behavioural** - sleeplessness, inability to concentrate, poor decision-making ability, mood swings, irritability, increased alcohol consumption, drug misuse, increased absence from work.

If stress is prolonged and relentless, these effects can lead to the complete physical and mental breakdown of the individual. The consequences for the individual can be extreme - job loss, divorce, alcoholism, drug addiction, etc. The consequences for the employer include increased absenteeism, poor relationships, conflict and higher staff turnover as well as potential civil law action.

## MANAGING THE RISK OF STRESS

Since it is not possible to remove pressure from the workplace, prevention strategies should focus on providing a management framework that takes into account the causes of stress:

- **Demands** (in terms of workload, speed of work and deadlines, etc.) - these should be reasonable and where possible, consultation with workers should take place.
- **Control** – workers should be given as much control over their work as possible, i.e. encouraged to take control over how work is to be done, priorities, etc.
- **Support** – workers should be provided with adequate information, instruction and training; they should have access to additional support when they need it.
- **Relationships** – clear policies should exist concerning acceptable standards of behaviour in the workplace; bullying and harassment should not be tolerated.
- **Role** – the organisation should be clear about what an individual's role actually is, their responsibilities and authority, and how they fit in to the larger organisational structure.
- **Change** – there should be careful planning and preparation of the change process. The reasons for change should be clearly explained and workers should be consulted where possible.

Many employers provide a confidential counselling service for employees, which can be provided in-house (by trained employees) or outsourced. This service can be useful to employees in dealing with both work-related and non-work related matters.

### MORE...

HSE has established a 'Management Standards' approach to the control of stress in the workplace, more information on which can be found at:

www.hse.gov.uk/stress/standards

### REVISION QUESTIONS

19. What is stress?
20. What are the three main types of effect that stress can have?
21. What can an employer do about the demands of the job in order to minimise the risk of stress?

(Suggested Answers are at the end.)

# Temperature

## KEY INFORMATION

- Extreme temperature environments can be found in some workplaces; exposure to extreme temperatures can have a number of physical effects on the worker.
- The health and safety effects of working in a hot environment include dehydration; muscle cramps; heat stress; heat stroke and burns.
- The health and safety effects of working in a cold environment include hypothermia; frost; slip hazards and freeze burn.
- In order to control the effects of extreme temperature, the workplace environment should be designed and regulated as far as possible to ensure safety and freedom from health risks.

## EFFECTS OF EXPOSURE TO EXTREMES OF TEMPERATURE

Extreme temperature environments can be found in some workplaces. For example, workers in a bakery will be exposed to a very hot, dry environment; workers at a cold storage warehouse will be exposed to a very cold environment. Those who work outdoors may be exposed to both extremes depending on climate and season.

Health and safety effects of working in a hot environment:

- Dehydration.
- Muscle cramps.
- Heat stress.
- Heat stroke.
- Burns.

Health and safety effects of working in a cold environment:

- Hypothermia.
- Frost
- Slip hazards.
- Freeze burn.

## CONTROL MEASURES

The workplace environment should be designed and regulated as far as possible to ensure safety and freedom from health risks. This is often not possible for outdoor workplaces, or at least only possible to a limited extent.

For indoor workplaces the **Workplace (Health, Safety and Welfare) Regulations 1992** require that indoor workplace temperatures are *reasonable*.

The Approved Code of Practice on these Regulations indicates that 'reasonable' means:

- A minimum temperature of 16°C where people are doing sedentary work.
- A minimum temperature of 13°C where people are doing physical labour.

There is no maximum indoor temperature stated.

Where it is not possible to regulate the indoor temperature and the temperature is going to be towards the extremes, then the first course of action is to eliminate the need for workers to enter the extreme temperature environment (e.g. by automation of a process).

Where this cannot be done the environment might be regulated to reduce the temperature extremes (e.g. heating a cold workplace to a more reasonable temperature). If these options are not possible then other controls must be considered that perhaps involve the use of personal protective equipment, job rotation and frequent breaks.

## REVISION QUESTIONS

22. Name one health effect of working in a very hot environment.
23. What is the minimum indoor workplace temperature for a workplace where people are doing sedentary work?

(Suggested Answers are at the end.)

## KEY INFORMATION

- Vehicle hazards can be controlled through the risk assessment process and by careful management of the workplace environment, the vehicles and the drivers.
- The workplace should be designed, constructed and maintained to allow safe vehicle movement and to separate vehicles from pedestrians.
- Vehicles should be suitable for their intended use and environment and maintained in safe working order.
- Drivers should be appropriately qualified, medically fit and given information, instruction, training and supervision.

When vehicles move around in workplaces they are a hazard to pedestrians, to other vehicles and to the driver. Vehicle accidents are responsible for many serious and fatal injuries and also cause significant property damage.

Typical vehicle accidents include:

- Being hit or run over by moving vehicles.
- Being struck by objects falling from vehicles.
- Falling from vehicles while loading.
- Falling from vehicles while unloading.
- Vehicles overturning.

Typical vehicle accidents include collisions and vehicle overturns (when the driver can easily be trapped or crushed between the vehicle and the floor).

Some of the highest risk situations occur when pedestrians have to interact with vehicles. Any collision between a vehicle and a pedestrian is likely to lead to serious or fatal injury.

## CONTROL STRATEGIES

The measures necessary to control the risks created by vehicle operations can be grouped under three main categories:

- The workplace environment.
- The vehicle.
- The driver.

### The Workplace Environment

Careful design and construction of the workplace can eliminate or reduce the risks created by vehicle operations:

- Vehicle and pedestrian free zones.
- Good traffic route layout.
- Segregation of vehicles and pedestrians.
- Separate site entrances for vehicles and pedestrians - this is best achieved using barriers to separate vehicles and pedestrians rather than simply marking pedestrian walkways.
- Speed limits.
- Signage.

### The Vehicle

Vehicles should be:

- Suitable for their intended use.
- Suitable for the environment and conditions in which they are used.
- Maintained in safe working order.
- Only driven by suitably trained, qualified staff.
- Inspected routinely before use.

## The Driver

Drivers should be:

- Competent to drive the vehicle: proof of qualification (e.g. driver's licence) may be necessary or the driver may have to be trained and assessed to achieve qualification.
- Medically fit to drive: a medical examination to assess the driver's health and fitness may be required.
- Provided with specific information, instruction and training appropriate to the workplace and site where they will be driving.
- Supervised to ensure that they obey site rules.

Supervisor with forklift truck driver

### REVISION QUESTIONS

24. What are the three main factors that must be managed to control the risks associated with vehicle operations?
25. What four control measures must be in place with regards the driver of any vehicle used for work purposes?

(Suggested Answers are at the end.)

## KEY INFORMATION

- Exposure to excessive vibration into the hand can cause Hand-Arm Vibration Syndrome (HAVS). Health effects can also be seen for whole body vibration.
- Legal exposure standards exist for both hand-arm vibration and whole body vibration.
- Vibration exposure can be controlled by eliminating or substituting the source; changing work techniques; maintenance; isolation; and minimising duration of exposure.

## EFFECTS OF EXPOSURE TO VIBRATION

The health effects associated with vibration exposure fall into two main categories.

- **Hand-Arm Vibration Syndrome (HAVS)**
  This is a condition that specifically affects the hands and arms as a result of a significant vibration.
  Symptoms include:
  - Muscle weakening.
  - Joint damage.
  - Nerve damage.
  - Vibration White Finger (VWF) – where the blood supply to the fingers shuts down and the fingers turn white.

Typical vibration white finger Source: L140 Hand-arm vibration, HSE, 2005 (www.hse.gov.uk/pubns/priced/l140.pdf)

- **Whole Body Vibration**
  Health effects can result from a significant vibration dose to the body, normally through the buttocks (sitting, e.g. dumper truck driver) or the feet and legs (standing, e.g. aircraft cabin crew). The most significant health effect is back pain as a result of damage to the soft tissues of the spine.

## VIBRATION EXPOSURE STANDARDS

Occupational vibration exposure is subject to the **Control of Vibration at Work Regulations 2005**. As with noise, the law requires that an assessment is undertaken of worker exposure to vibration. This assessment might measure vibration exposure directly using a meter or it might use manufacturers' data.

Two different types of vibration exposure are recognised (hand-arm vibration and whole body vibration) and two daily personal vibration exposure levels are set which put different legal requirements on the employer:

- At the exposure **action value** the employer must:
  - Carry out a vibration assessment.
  - Reduce vibration exposure to the lowest level reasonably practicable.
  - Provide information, instruction and training to employees.
  - Carry out health surveillance.
- If exposure is at the higher limit value then the employer must:
  - Carry out a vibration assessment.
  - Immediately reduce exposure below the limit value.

## VIBRATION EXPOSURE CONTROL

In simple terms vibration exposure can be controlled in three ways:

- Reduce the vibration at source:
  - Eliminate the source.
  - Substitute the source.
  - Change work techniques.
  - Maintenance.
- Interrupt the pathway from source to receiver:
  - Isolation.
- Limit the duration of exposure:
  - Job rotation.

Health surveillance is a requirement of the **Control of Vibration at Work Regulations 2005** for workers exposed to high vibration levels. In the first instance this health surveillance might simply consist of looking at a worker's medical history and asking about symptoms of health effects. If problems are detected then workers should be referred to a doctor.

## REVISION QUESTIONS

26. What are the typical symptoms of Hand-Arm Vibration Syndrome (HAVS)?
27. How can vibration exposure be controlled?

(Suggested Answers are at the end.)

## KEY INFORMATION

- Work-related violence is any incident in which a person is abused, threatened or assaulted in circumstances relating to their work. Various factors influence the risk of work-related violence and many occupations are at risk.
- Risk of violence can be managed by providing workplace security measures, establishing safe systems of work (especially for lone workers) and providing information, instruction and training.

Work-related violence includes incidences where workers are verbally abused, threatened and even assaulted as they carry out their work. There is a growing awareness of this issue and an understanding that abuse, threats and assault are not inevitable occupational risks that should simply be accepted and ignored.

### RISK FACTORS FOR VIOLENCE

Certain occupations and types of work are associated with an increased risk of violence. The following factors are common to those occupations:

- Cash handling.
- Lone working.
- Representing authority.
- Wearing a uniform.
- Dealing with people under stress.
- Dealing with people under the influence.

A stressful situation can sometimes spill over into abuse, threat and assault

Occupations at risk of violence involve one or more of these risk factors, such as:

- Hospital staff.
- Police.
- Social workers.
- Bus and taxi drivers.
- Fire-fighters and paramedics.
- Railway staff.

### EFFECTS OF VIOLENCE

Violence that involves actual physical assault can obviously cause physical harm to people. Perhaps of even greater concern is the psychological impact that threats, abuse and assault can have. These psychological effects can include:

- Insomnia.
- Stress.
- Anxiety.
- Irritability.
- Loss of confidence.
- Agoraphobia.
- Thoughts of self harm.
- Guilt.

## PREVENTION STRATEGIES FOR VIOLENCE

The first step in managing the risk of work-related violence is to find out the exact nature of the problem. This can be investigated by:

- Collecting and analysing incident reports.
- Interviewing staff formally or informally.
- Staff surveys.

It will then be possible to identify and implement the correct preventive measures, which will be different depending on the nature of the workplace and of the work.

In general, two distinct strategies can be adopted:

- **Preventing violence in an office:**
  - Zero tolerance policy and prosecution of offenders.
  - Security staff.
  - CCTV cameras.
  - Security doors between public areas and staff areas.
  - Minimise queues and waiting times.
  - Training for staff.
  - Screens between staff and public.
  - Panic alarms.
- **Preventing violence to workers conducting home visits:**
  - No lone working.
  - Keeping records of past incidents and vetting customers.
  - Visit-logging with supervisor.
  - Pre- and post-visit telephone calls.
  - Training for staff.
  - Having a means of communication.
  - Not carrying cash or valuables.

### REVISION QUESTIONS

28. What is work-related violence?
29. What types of work activity are commonly associated with a higher risk of work-related violence?
30. What is the first step in managing the risk of work-related violence?

(Suggested Answers are at the end.)

## KEY INFORMATION

Minimum welfare provision means ensuring that workers have access to drinking water; sanitary conveniences; washing facilities; changing rooms and accommodation for clothing; and places to rest and eat food.

## MINIMUM WELFARE STANDARDS

Under the **Workplace (Health, Safety and Welfare) Regulations 1992**, minimum welfare standards are:

- **Drinking water** – access to clean drinking water.


Workers should have access to drinking water

- **Sanitary conveniences** – access to a sufficient number of sanitary conveniences (WCs) for the number of workers present, with separate facilities for men and women.
- **Washing facilities** – access to suitable washing facilities by sanitary conveniences, changing facilities and as required in work areas.
- **Changing rooms** – suitable changing facilities if workers have to change into special workwear.
- **Storage for clothing** – lockers or other storage facilities where workers have to change for work so that their personal clothing can be kept clean and secure.
- **Rest and eating facilities** – access to suitable rest areas where workers can take a break from work. Eating facilities should be provided so that food can be eaten in a hygienic environment. If hot food is not provided at work then basic facilities might be provided so workers can make their own hot drinks and food.

## REVISION QUESTION

31. Name three of the basic welfare provisions that an employer has to make for his workers.

(Suggested Answer is at the end.)

# Work at Height

## KEY INFORMATION

- Work at height (work where there is a risk of a fall liable to cause personal injury) results in more fatalities than any other work activity.
- Work at height should be avoided where possible. Where this is not possible engineering measures, such as edge protection, should be used to prevent falls. Where this cannot be done measures should be taken to minimise the distance fallen and the consequences of the fall.

Work at height is work where there is a risk of a fall liable to cause personal injury. Note that it is possible to work at height whilst underground or at ground level (e.g. at the side of a sheer drop).

Working at height causes a higher proportion of fatalities than any other type of work activity. Falls from height can result in:

- Death.
- Neck or spinal injury leading to permanent paralysis.
- Multiple broken bones.

Falling objects can also cause severe injuries that may result in death, brain damage, paralysis or multiple broken bones.

As a result, work at height is regulated by the **Work at Height Regulations 2005**. The Regulations apply a risk assessment based approach to the management of work at height and impose a simple hierarchy:

- Avoid work at height.
- Prevent falls.
- Minimise the distance and consequences of falls.

When applying the last two controls you should prioritise collective protection over personal protection.

The Regulations also require the provision of appropriate information, instruction and training to workers.

It is important that all work at height is risk assessed by a competent person. Where the work at height cannot be eliminated then suitable equipment must be provided to allow the work to proceed safely. This may involve the use of access equipment, such as:

- Scaffolds and tower scaffolds.
- Mobile Elevated Working Platforms (MEWPs).
- Ladders.

A worker gains entry to the top work platform of a tower scaffold.

## REVISION QUESTIONS

32. What do we mean by work at height?
33. What is the first option in the simple hierarchy of controls set out in the **Work at Height Regulations 2005**?

(Suggested Answers are at the end.)

## SUMMARY

In Module 5, we have:

- Outlined the **classification**, **routes of entry** and **health effects** of **chemicals** and the hierarchy of control that can be used to eliminate or control exposure.
- Outlined the health effects of **Display Screen Equipment (DSE)** and the precautions for safe use of DSE.
- Outlined the hazards of **electricity** and the basic protection methods and devices.
- Outlined the **fire triangle**, the common causes of **workplace fires** and the basic requirements for fire **prevention** and fire **precautions**.
- Outlined the common injures caused by **manual handling**, the factors to be assessed during a manual handling **risk assessment** and the control of manual handling risk.
- Outlined the hazards associated with **movement of people** and the precautions necessary to control these hazards.
- Outlined the health risks associated with exposure to excessive **noise**, the basic legal requirements for a **noise assessment** and how exposure to excessive noise can be controlled.
- Defined **stress**, outlined some of the causes and effects of stress and a framework for the management of the risk.
- Outlined an approach to the control of **vehicle hazards** by management of the workplace environment, the vehicles and the drivers.
- Outlined the health effects of exposure to excessive **vibration**, the **legal exposure standards** and the basic principles of controlling vibration exposure.
- Defined **work-related violence** and outlined how the risk of violence can be managed by providing workplace **security** measures, establishing **safe systems of work** and providing **information**, **instruction** and **training**.
- Outlined minimum **welfare provision** requirements as ensuring that workers have access to drinking water; sanitary conveniences; washing facilities; changing rooms and storage for clothing; and places to rest and eat food.
- Defined **work at height** and outlined the legal requirement to **avoid** work at height where possible, **prevent** falls, or **minimise** the distance and consequences of a fall.

# INVESTIGATING ACCIDENTS AND INCIDENTS

MODULE 6

## LEARNING OUTCOMES

On completion of this module, you should be able to:

1. Define the meaning of the terms 'accident', 'incident' and 'near miss'.
2. Outline the reasons for investigating accidents and incidents.
3. Explain the immediate, underlying and root causes of accidents and incidents.
4. Outline the legal requirements for the reporting of certain types of event to the authorities.
5. Explain the stages in accident and incident investigation.

# Contents

## KEY INFORMATION

- An accident is an unplanned, unwanted event which leads to injury, damage or loss.
- An incident or near miss is an unplanned, unwanted event that had the potential to lead to injury, damage or loss but did not, in fact, do so.
- There are many reasons why accidents and incidents should be investigated, the most important of which is to prevent recurrence.
- Accidents have immediate causes. These arise from underlying causes and root causes, which are often failures in health and safety management.

When an accident, or some other type of incident, occurs in the workplace it should be investigated and the investigation should be recorded.

## DEFINITIONS

A failure to adequately assess risk in the workplace will lead to accidents and incidents. These are categorised depending on the outcome:

- **Accident**
  "An unplanned, unwanted event which leads to injury, damage or loss."
  For example, a worker on the ground is struck on the head and killed by a brick dislodged by another worker on a 5m high scaffold.
- **Incident**
  "An unplanned, unwanted event that had the potential to lead to injury, damage or loss but did not, in fact, do so."
  For example, a worker dislodges a brick from a 5m high scaffold and it narrowly misses another worker standing on the ground. No injury results and the brick is not even broken.

The only thing that separates accidents and incidents is the outcome of the event. An accident causes loss, an incident does not.

It is common for the phrase **near miss** to be used instead of incident.

It is essential to recognise why incidents or near misses are important. Simply put, why should we be interested in near misses when nothing bad resulted? Many incidents or near misses are minor events of little or no consequence, if they were to happen again there would still be no serious outcome. However, in some cases near misses have the **potential** for very serious injury. These near misses should be thoroughly investigated and preventive measures should be put in place so that a serious accident does not occur.

When looking at accidents and incidents it is often useful to ask the question; what was the **potential** worst case outcome? If the potential was for serious injury or worse, then the event deserves thorough investigation - even though the actual event that is being investigated may have only caused minor or no injury or damage.

## REASONS FOR INVESTIGATION

There are many reasons for conducting investigations, but one of the most important is that having happened once, an accident may happen again - and next time the outcome may be just as bad, or even worse. It is therefore important to understand exactly **why** the accident occurred so that corrective action can be taken to prevent a recurrence.

Reasons for carrying out an incident investigation:

- To identify corrective action to prevent a recurrence.
- To identify the immediate, underlying and root causes – incidents are usually caused by unsafe acts and unsafe conditions in the workplace, but these often arise from underlying and root causes.
- To record the facts of the incident – people do not have perfect memories and accident investigation records document factual evidence for the future.
- For legal reasons – accident investigations are an implicit legal duty imposed on the employer.
- For claim management – if a claim for compensation is lodged against the employer then the insurance company will examine the accident investigation report to help determine liability.

- For staff morale – failure to investigate accidents has a negative effect on morale and safety culture (by 'safety culture' we mean the way that all people within the organisation think and feel about health and safety and how this translates into behaviour). If accidents are not investigated then workers will assume that the organisation does not value their safety and does not think that safe behaviour is a high priority.
- For disciplinary purposes – though blaming workers for incidents has a negative effect on safety culture, there are occasions when an organisation has to discipline a worker because their behaviour has fallen short of the acceptable standard.
- For data gathering purposes – accident statistics can be used to identify trends and patterns.

## HOW ACCIDENTS AND INCIDENTS ARE CAUSED

It is important to recognise that all accidents have causes. They are the end result of a chain of events that can be logically investigated and understood.

It is also important to note that accidents have both immediate and underlying causes:

- **Immediate causes** - these are the unsafe acts and unsafe conditions that gave rise to the event itself, i.e. the things that occurred at the time and place of the accident. For example, if a worker slips on a patch of oil spilt on the floor then the immediate causes are the slip hazard (unsafe condition) and the worker walking through it (unsafe act).
- **Underlying and root causes** – these are the things that lie behind the immediate causes. Often root causes will be failures in the management system, such as:
  - Failure to adequately supervise workers.
  - Failure to provide appropriate PPE.
  - Failure to provide adequate training.
  - Lack of maintenance.
  - Inadequate checking or inspections.
  - Failure to carry out proper risk assessments.

For example, in the case of the slip accident we described above, the root causes might be a poorly maintained machine that has leaked oil onto the floor, and a poorly inspected and maintained workshop with inadequate lighting levels. Here the worker might be blameless on the basis that, given those conditions, the accident was bound to happen eventually.

It is often the case that workplace accidents are complex and have multiple causes - there are several immediate causes for the accident and each of these might have several underlying and root causes.

This idea is usually referred to as **multi-causation theory**.

For example, consider an accident where a worker has been struck by a load being carried by a forklift truck.

- **Immediate causes** for such an accident might be:
  - The pedestrian walking out in front of the forklift truck.
  - Excessive braking of the forklift truck.
  - The load falling from the forklift truck.
- **Underlying causes** of such an accident might be:
  - An inattentive pedestrian who is overly familiar with the workplace and has become complacent.
  - Excessive speed of the forklift truck.
  - Poor road positioning of the forklift truck close to a pedestrian exit.
  - Failure to secure the load on the pallet.

On investigation, each of these underlying causes might have their own separate **root causes**, such as:

- No refresher training for existing staff, allowing experienced staff to become complacent.
- Lack of segregation of pedestrian and traffic routes; no barriers and no marking to separate the two.
- Poor maintenance of the truck.
- No training for the driver, who is new to the workplace and unaware of the load securing technique required.
- Lack of proper induction for the new driver so they are unaware of the layout and position of pedestrian exits, etc.

If there are multiple causes for the accident then it is important that each of these causes is identified during the investigation, otherwise incomplete corrective action will be taken and similar accidents may happen in the future.

## REVISION QUESTIONS

1. Define what is meant by the word 'accident'.
2. Give three reasons why accidents should be investigated.
3. What is the difference between the immediate causes and root causes of accidents?

(Suggested Answers are at the end.)

# Accident and Incident Investigation

## KEY INFORMATION

- Accidents and incidents have to be reported and recorded internally within an organisation.
- Certain types of event have to be reported to the enforcing authorities under the **Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013 (RIDDOR)**.
- Accident investigation is a four step process of gathering factual information about the event; analysing that information to draw conclusions about the immediate and root causes; identifying suitable control measures; and planning the corrective actions.

Accidents and incidents need to be internally reported within an organisation. Sometimes they have to be reported to the enforcing authority as well.

## ACCIDENT AND INCIDENT REPORTING

Work-related accidents and incidents should be reported internally by workers to management. Arrangements must be made for this to occur. It is standard practice for workers to report incidents to their immediate line manager verbally, followed by completion of an internal accident/incident report form.

As a minimum, organisations must keep a record of all work-related accidents that result in personal injury. This is dictated by social security legislation and there is a standard accident book that can be used. The accident book contains a form that should be completed to make a record of each accident. This record must then be removed from the book and kept by a responsible person under lock and key in order to comply with the **Data Protection Act 1998**. Records must be kept for a minimum of three years.

Typical contents of an accident record:

- Name and address of casualty.
- Date and time of accident.
- Location of accident.
- Details of injury.
- Details of treatment given.
- Description of event causing injury.
- Details of any equipment or substances involved.
- Witnesses' names and contact details.
- Details of person completing the record.
- Signatures.

## The Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013 (RIDDOR)

The **Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013 (RIDDOR)** require the reporting of certain types of event (reportable events) to the enforcing authorities.

There are five main types of reportable event:

- Fatality – where any person dies as a result of a work-related accident.
- Specified injury – where a worker suffers a major injury, such as a broken bone (other than fingers and toes) or amputation.
- Dangerous occurrence – where a specific incident, such as the failure of a load-bearing part of a lift, occurs.
- Disease – where a worker is diagnosed as suffering from specific work-related diseases, such as lead poisoning.
- Over-seven-day injury – where a worker suffers an injury as a result of a work-related accident that prevents them from doing the full range of their normal duties for over seven consecutive days (not counting the day of the accident). Although they do not have to be reported, a record must be kept of any absence which lasts for more than three days.

If one of these reportable events occurs it must be reported to the relevant enforcing authority. The HSE have an Incident Contact Centre where all **RIDDOR** reports can be sent. All events have to be reported in writing (this can be done online). Some have to be notified immediately by telephone.

Copies of reports must be kept by a responsible person for three years.

It is possible that an HSE inspector (or environmental health officer) will visit the workplace as a result of a reported accident or incident. When they do it is important to recognise that they have significant investigating power under the **Health and Safety at Work, etc. Act 1974**. These include the right to:

- Gain entry to the workplace - it is an offence to refuse an enforcement officer entry into the workplace.
- Take photographs, samples and physical evidence.
- Inspect and copy documents and records.
- Interview people and take statements.

The inspector might, of course, use their formal enforcement powers if they find breaches of health and safety law.

## STAGES IN THE INVESTIGATION

When investigating an accident or other type of incident there are some basic principles and procedures that can be used:

- Step 1: Gather factual information about the event.
- Step 2: Analyse that information and draw conclusions about the immediate and root causes.
- Step 3: Identify suitable control measures.
- Step 4: Plan the remedial actions.

However, before the investigation can begin there are two important issues that should be considered:

- Safety of the scene – is the area safe to approach? Is immediate action needed to eliminate danger even before casualties are approached?
- Casualty care – any injured people will require first-aid treatment and may need hospitalisation. This is, of course, a priority. It is also worth considering the welfare of uninjured bystanders who may be in shock.

Once immediate danger has been eliminated and casualties have been attended to, a decision may have to be made about the type or level of investigation. Is this to be:

- A relatively simple investigation of an incident that caused no (or only minor) outcomes and did not have the potential to cause serious outcomes?
- A more in-depth and thorough investigation of an incident with serious outcomes or the potential for serious outcomes?

The first type of investigation might be carried out by the line manager of the area. The second type often involves a team of investigators that might include:

- Safety specialists.
- Senior managers.
- Technical specialists.
- Worker representatives.

## Step 1: Gathering Information

- Secure the scene as soon as possible to prevent it being altered.
- Collect witnesses' details quickly, before they start to move away.
- Collect factual information from the **scene** and record it. This might be done by means of:
  - Photographs.
  - Sketches.
  - Measurements.
  - Videos.
  - Written descriptions of factors such as wind speed, temperature, etc.
  - Taking physical evidence.

The investigator should come prepared with the right equipment to record this information.

- Once the scene has been thoroughly examined, move on to the second source of information, **witnesses**. Witnesses often provide crucial evidence about what occurred before, during and after incidents. They should be interviewed carefully to make sure that good quality evidence is gathered.

Good witness interview technique requires that the interviewer should:

- Hold the interview in a quiet room or area free from distractions and interruptions.
- Introduce themselves and try to establish a working relationship with the witness using appropriate verbal and body language.
- Explain the purpose of the interview (perhaps emphasising that the interview is not about blaming people).
- Use open questions, such as those beginning with What?, Why?, Where?, When?, Who?, How?, etc. that do not put words into the witnesses' mouths and do not allow them to answer with a "yes" or "no".
- Keep an open mind.
- Take notes so that the facts being discussed are not forgotten.
- Ask the witness to write and sign a statement to create a record of their testimony.
- Thank the witness for their help.

- Once witnesses have been interviewed, move on to the third source of information: **documentation**. Various documents may be examined during an accident investigation, such as:
  - Company policy.
  - Risk assessments.
  - Training records.
  - Safe systems of work.
  - Permits-to-work.
  - Maintenance records.

## Step 2: Analysing Information

The purpose here is to draw conclusions about the immediate, underlying and root causes of the incident.

If there are multiple causes for the accident then it is important that each of these causes is identified during the investigation, otherwise incomplete corrective action will be taken and similar accidents may happen in the future.

## Step 3: Identify Suitable Control Measures

Control measures must be identified to correct both the immediate and underlying causes.

Corrective actions for immediate causes are usually easy to identify - if there is a spill of oil on the floor, clean it up; if the guard is missing from the machine, reattach it. Corrective action for the underlying and root causes can be harder to determine, but this is essential if similar accidents are to be prevented.

If you clean up the oil leaking out of a vehicle in the distribution depot but fail to deal with the underlying cause (lack of inspection and maintenance), then more leaks will occur in future which will lead to more pedestrian slips (and perhaps vehicle skids).

If you clean up the oil leaking out of a vehicle **and** deal with the underlying cause (by introducing a proper inspection and maintenance system) then there is a good chance that most oil leaks will be prevented in the future for all vehicles in the fleet at all locations.

Perhaps the two most important questions to ask when identifying control measures are:

- If this action is taken, will it prevent the same accident from happening in exactly same way again?
- If this action is taken, will it prevent other similar types of accident from happening in similar circumstances in the future?

If the answer to both of these questions is "no", then you need to identify other control measures.

## Step 4: Plan the Remedial Actions

An accident investigation should lead to corrective action being taken.

Corrective actions (sometimes referred to as remedial actions) can be presented in an action plan:

| Recommended action | Priority | Time-scale | Responsible person |
|---|---|---|---|
| Introduce induction training for all new drivers | Medium | 1 month | Warehouse manager |

When the action plan is being prepared the control measures must be given suitable priorities and timescales. Unsafe conditions must not be allowed to persist in the workplace. Dangerous practices and high risk activities must be dealt with immediately.

There may be temporary control measures that can be introduced in the short- to medium-term to allow work to proceed while long-term solutions are pending. For example, a perimeter guard might be fitted around an overheating industrial machine while new cooling units are sourced and delivered.

### REVISION QUESTIONS

4. State three items of information that should be noted in an accident record.
5. State three types of event that have to be reported to the enforcing authorities under **RIDDOR**.
6. How can factual information gathered from the scene of an accident be recorded?
7. How should a witness interview be conducted to get all of the necessary information from the witness?

(Suggested Answers are at the end.)

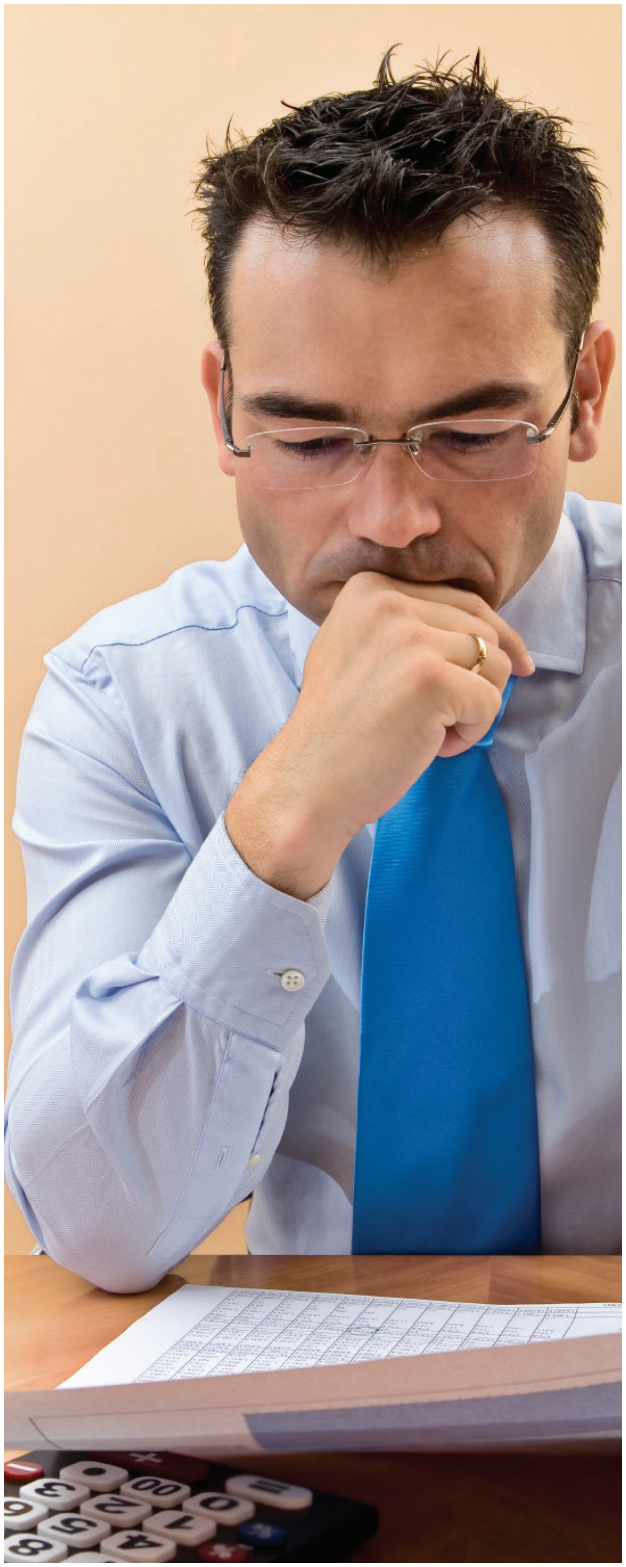
## SUMMARY

In Module 6, we have:

- Defined an accident as 'an unplanned, unwanted event which leads to injury, damage or loss' and an incident or near miss as 'an unplanned, unwanted event which had the potential to lead to injury, damage or loss but did not, in fact, do so'.
- Outlined the reasons why accidents and incidents should be investigated, the most important of which is to prevent recurrence.
- Explained how accidents have immediate causes that arise from underlying causes and root causes, which are often failures in health and safety management.
- Outlined how and why accidents and incidents have to be reported and recorded internally within an organisation.
- Described the types of event that have to be reported to the enforcing authorities under the **Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013**.
- Explained accident investigation as a four step process of gathering factual information about the event; analysing that information to draw conclusions about the immediate and root causes; identifying suitable control measures; and planning the remedial actions.

# MEASURING PERFORMANCE

MODULE 7



## LEARNING OUTCOMES

On completion of this module, you should be able to:

1. Explain the reasons for and meaning of performance measurement.
2. Outline ways in which performance can be reactively measured.
3. Outline ways in which performance can be proactively measured.
4. Explain the key principles of auditing and the differences between internal and external audits.

# Contents

## KEY INFORMATION

- Measuring health and safety performance can be done using proactive and reactive performance indicators.
- Reactive performance measurement usually involves the collection and use of accident, incident and ill-health statistics, such as the injury incidence rate.
- Proactive performance measurement involves measuring compliance to health and safety standards such as the completion of safety inspections.

Every organisation measures its performance in one way or another. This is often done using 'Key Performance Indicators' (KPIs). These are specific measurements which give a clear indication of performance, e.g. a football club will measure its performance during a match by looking at the number of goals scored. It can also look at its performance over time by looking at its position in the league and its league performance year on year.

## PERFORMANCE MEASUREMENT

Health and safety performance should be monitored in the same way as other areas (such as sales and production).

This can be done using a variety of indicators that fall into two broad categories:

- **Proactive indicators** – indicate if health and safety standards are correct in the workplace before accidents, incidents or ill health are caused.
- **Reactive indicators** – use accidents, incidents and ill health as indicators of performance to highlight areas of concern.

In most workplaces both proactive and reactive monitoring have their place.

Performance measurement indicators provide us with three key pieces of information:

- What's going on around us.
- What has happened so far.
- Potential problems or dangers that we may need to respond to.

Monitoring should be a line management function, and senior management has responsibility for ensuring that effective health and safety performance monitoring systems are in place.

A range of people will be interested in information about an organisation's health and safety performance. Some of these groups will be internal to the organisation:

- Senior management.
- Line managers.
- Employees.
- Safety/employee representatives.
- Shareholders.

## Reactive Performance Measurement

Reactive performance measurement uses accidents, incidents, ill health and other unwanted events and situations as indicators of health and safety performance, in order to highlight areas of concern. By definition this means "reacting" **after** things have gone wrong. Reactive monitoring is a vital tool for an organisation to use as long as some proactive measures are being carried out as well.

There are two principal methods of carrying out reactive monitoring:

- Learn lessons from one individual event such as an accident, a dangerous occurrence, a near miss or a case of ill health.
- Learn lessons from data gathered from a large number of events.

The first method involves incident reporting, recording and investigation that has already been discussed in Module 6. The second method is concerned with the collection and use of **statistics**.

### Statistics

Data can be collected about a number of different unwanted events such as:

- Accidents.
- Incidents or near misses.
- Ill health.
- Days lost due to injury.

This data can then be analysed to see if there are any:

- Trends – consistent increases or decreases in the number of certain types of event over a period of time.
- Patterns – large numbers or "hot-spots" of certain types of event.

This analysis usually involves converting the raw data (i.e. the actual numbers) into an **accident rate** so that more meaningful comparisons can be made.

One popular accident rate used to measure an organisation's safety performance is the **Injury Incidence Rate (IIR)**:

$$IIR = \frac{\text{Number of reportable injuries during a specific time period (e.g. a year)}}{\text{Average number of workers over the same time period}} \times 100{,}000$$

The answer is in units of 'reportable injuries per 100,000 workers'.

This allows for a meaningful comparison of accident statistics from one year to the next, even though more or fewer workers may be present in the workplace.

Using a standard accident rate also allows one organisation to compare its accident statistics to those of other similar organisations or to the industry average. This is often referred to as benchmarking and is common in certain industries (e.g. construction).

## Proactive Performance Measurement

Proactive performance measurement is concerned with checking standards before an unwanted event occurs. The intention is to identify:

- Compliance with standards, so that good performance is recognised and maintained.
- Non-compliance with standards, so that the reason for that non-compliance can be identified and a suitable corrective action put in place to remedy any shortfall.

### Performance Standards

In order to proactively monitor performance standards you have to identify exactly which performance standard to monitor and what level of performance is acceptable.

You could proactively monitor the following activities to give a measure of performance:

- The number and quality of risk assessments covering work activities.
- The provision of health and safety training to schedule. The completion of consultative committee meetings to schedule.
- The completion of workplace inspections to schedule.
- The completion of safety review meetings to schedule.

All of these management activities **should** be taking place in the workplace, so it is possible to assess whether they are happening or not.

In most instances you can also measure the degree to which these activities are happening and perhaps assess their quality. For example, a standard might be that when contractors start new work on site there should be suitable and sufficient risk assessments to cover their work. The presence or absence of risk assessments can be checked. The number of risk assessments can be measured and the quality of each risk assessment can also be judged. In this way a full picture of compliance can be built up.

### Systematic Inspections

One popular way to actively monitor health and safety performance is to carry out systematic inspections. These inspections can focus on the **four Ps**:

- **Plant** – machinery and vehicles as well as any statutory inspections and examinations.
- **Premises** – the workplace and the working environment.
- **People** – working methods and behaviour.
- **Procedures** – safe systems of work, method statements, permits-to-work, etc.

An inspection might concentrate on one, several or all four of these areas. Systematic inspection regimes usually exist in many different forms within different workplaces.

## CASE STUDY

The Head Office at a bank introduces an inspection system to actively monitor general health and safety standards.

A set of formal arrangements are documented and included in the safety policy of the company. These arrangements describe:

- The purpose of the inspection system – to monitor general health and safety standards.
- The frequency of the inspections – once a month for all areas.
- The persons responsible – managers of a particular grade for ensuring that inspections are carried out, managers of the next grade down for actually doing the inspections.
- The competence of inspectors – the need for inspecting managers to attend a one-day course on the inspection system.
- An inspection checklist – a generic checklist is created which is appropriate to all office areas, which may be tailored by the inspector if necessary.
- Follow up arrangements – an action plan table is created and included on the inspection checklist.

If this inspection regime is put in place then it is possible to proactively measure the degree to which each is being carried out successfully. This might be done simply by counting the total number of inspections carried out in a month as a percentage of the total number of inspections that were scheduled to take place.

There are no 'one size fits all' performance indicators. Each organisation has to select the performance indicators that are of most use to its specific needs. Whichever types of reactive or proactive performance indicators are used by an organisation, there are some general characteristics that should be considered.

Good performance indicators are:

- Objective rather than subjective.
- Easy to measure.
- Relevant and give a real indication of performance.
- Cost-effective.
- Understandable by everyone in the organisation.

## REVISION QUESTIONS

1. What are the two main ways of measuring performance?
2. How is the injury incidence rate calculated?
3. How can health and safety performance be proactively measured?

(Suggested Answers are at the end.)

# Auditing

## KEY INFORMATION

- Auditing is the systematic, objective, critical evaluation of an organisation's health and safety management system.
- During an audit several different sources of information such as documents and records; staff and direct observations of the workplace, etc. will be used to verify compliance to recognised standards.
- Audits can be conducted by internal staff or by external specialists and there are advantages and disadvantages to each type.

## WHAT IS AUDITING?

### GLOSSARY

**AUDITING**

"The structured process of collecting information on the effectiveness and reliability of the health and safety management system and drawing up plans for corrective action."

A shorter definition might be that auditing is the systematic, objective, critical evaluation of an organisation's health and safety management system.

Auditing is a mechanism for verifying that an organisation's safety management system is in place and operating effectively. The intention of an audit is to provide critical feedback on the management system so that appropriate follow-up action can be taken. An audit can, therefore, be viewed as negative since it will tend to focus on areas of weakness and non-conformance. In fact some audits do not make any mention of any positive aspects of the safety management system at all; they focus entirely on the weaknesses.

### The Distinction Between Audits and Inspections

An audit focuses on management systems:

- It examines documents such as the safety policy, arrangements, procedures, risk assessments, safe systems of work, method statements, etc.
- It looks closely at records such as those created to verify training, maintenance, inspections, statutory examinations, etc.
- It verifies the standards that exist within the workplace by interview and direct observation.

An inspection is a simpler process of checking the workplace for uncontrolled hazards and addressing any that are found.

### The Audit Process

Different audits are run in different ways; below is a fairly typical audit process.

#### Pre-Audit Preparations

Before the audit starts the following should be defined:

- Date and time of the audit – so that all necessary resources and personnel can be made available.
- The scope of the audit – will it cover health and safety, or will other topics such as environmental management be included as well?
- The area and extent of the audit – one department, one whole site, all sites?
- Who will be required – auditors will need to be accompanied during their visit and will need access to staff.
- Information gathering – copies of relevant documents (such as policy documents) will need to be collated before starting the audit.

#### During the Audit

Auditors will use three sources of information during the audit:

- **Documents and Records** – such as policy documents and training records which indicate what should be happening and what has happened with regards to a particular issue.
- **Interviews** – word-of-mouth evidence given by managers and workers.
- **Direct observation** – of the workplace, equipment, activities and behaviour.

Auditors will sometimes seek to collect evidence so that their findings cannot be refuted; this can be done by copying paperwork, taking photographs; and having a witness to corroborate word-of-mouth evidence.

An auditor's favourite phrases are "show me" and "prove it".

### At the End of the Audit

Verbal feedback is usually provided at the end of an audit. This will then be followed by a written report. The report will make recommendations for improvement with an indication of priorities and timescales. It is essential that an audit is followed up with action to correct non-compliances. These corrective actions will usually be checked during the next audit. In some auditing systems this will be done through an interim follow-up visit.

## INTERNAL AND EXTERNAL AUDITS

Audits are often carried out by safety specialists from outside the organisation; they can also be done by in-house staff. In many instances both types of audit are carried out at different frequencies by the organisation.

There are advantages and disadvantages to both types:

| | Advantages | Disadvantages |
|---|---|---|
| **External Audits** | • Independent of any internal influence.<br>• Fresh pair of eyes.<br>• May have wider experience of different types of workplace.<br>• Recommendations often carry more weight. | • Expensive.<br>• Time consuming.<br>• May not understand the business so make impractical suggestions.<br>• May intimidate workers so get incomplete evidence. |
| **Internal Audits** | • Less expensive.<br>• Auditors already know the business so know what can be realistically achieved.<br>• Improves ownership of issues found.<br>• Builds competence internally. | • Auditors may not notice certain issues.<br>• Auditors may not have good knowledge of industry or legal standards.<br>• Auditors may not possess auditing skills so may need training.<br>• Auditors are not independent so may be subject to internal influence. |

## REVISION QUESTIONS

4. What is critically examined during a health and safety audit?
5. What are the three separate sources of information that are normally used by an auditor?
6. Name one advantage and one disadvantage of external auditing.

(Suggested Answers are at the end.)

# Summary

## SUMMARY

In Module 7, we have:

- Explained how health and safety performance can be measured using **proactive** and **reactive** performance indicators.
- Outlined how reactive performance measurement usually involves the collection and use of accident, incident and ill-health **statistics**.
- Defined one reactive performance indicator - the **injury incidence rate**.
- Outlined how proactive performance measurement involves measuring compliance to health and safety standards such as completion of safety **inspections**.
- Explained **auditing** as the systematic, objective, critical evaluation of an organisation's health and safety management system.
- Outlined the **audit process** and the use of documents and records, interviews with staff and direct observation of the workplace to verify compliance to recognised standards.
- Explained that audits can be conducted by **internal staff** or by **external specialists** and the advantages and disadvantages of each type.

# PROTECTING OUR ENVIRONMENT

MODULE 8

## LEARNING OUTCOMES

On completion of this module, you should be able to:

1. Outline the impact of industry on the environment.
2. Define what is meant by pollution and waste and give examples of typical industrial waste streams.
3. Explain how pollution and waste can be controlled.
4. Outline the key elements of an environmental management system.

# Contents

## KEY INFORMATION

- The environment is the air, land and water.
- Organisations have an impact on the environment through pollution events and through the waste that they produce.
- Pollution is the release of hazardous substances or energy into the environment.
- Waste is anything thrown away by an organisation because it is no longer needed or wanted.

Over recent years there has been growing awareness that businesses and organisations have an impact on the wider environment. This has lead to increased statutory regulation and a requirement for businesses to manage their impact on the environment. There are many similarities between environmental management and health and safety management. This last module introduces the topic of environmental management and explains some of the key concepts.

## POLLUTION AND WASTE

### GLOSSARY

**THE ENVIRONMENT**

The air, land and water.

There are lots of different ways of thinking about the environment. One way is to picture planet earth suspended in space and to consider the entire planet as the environment; a whole planet operating as one complex system of air, land and water, sustaining all of the incredibly varied and complex forms of life. Another equally valid way is to think of the environment as being very local to you; the air outside your building, the land within and just outside your boundary and the water raining down onto your site, collecting in the drains and running into the local brook.

Both of these ways of thinking about the environment are equally valid and in reality there is no cut-off point where the local environment ends and the global one begins. The environment does not recognise county or country boundaries.

Both the local and global environment are important because they support all life on earth, including us. They also have a significant impact on our health (e.g. contaminated land is responsible for poisoning the people who live on it or get their food from it) and well-being (e.g. most of us enjoy a rural view far more than looking at an industrial estate).

Unfortunately businesses and organisations of all types and sizes have an impact on the environment. This impact arises from:

- **Work activities**, e.g. a construction project will often cause disruption to land outside of the immediate area of the build.
- **Raw materials**, e.g. a printing company will use paper as a raw material that is made from wood pulp sourced from forests (and probably contains china clay quarried from the ground as well).
- **Products**, e.g. a washing machine manufacturer will use large amounts of packaging material when shipping its products.
- **Waste**, e.g. a pizza company will discharge large volumes of contaminated cleaning water down the drains as well as lots of spoiled food and damaged packaging materials into the bins.

Some of these impacts will be in the form of **pollution**.

### Pollution

### GLOSSARY

**POLLUTION**

The release of harmful substances or energy into the environment where it might contaminate air, land or water.

Pollution sometimes has an impact on the environment at a very limited and local level, e.g. a small spill of diesel fuel on to land. However, at other times the impact is far greater, e.g. the oil spill that resulted from the explosion of the **Deepwater Horizon** drilling platform in 2010. It is also worth considering that sometimes the impact of pollution occurs over many years as a result of a gradual release into the environment. Climate change is said to be the result of the gradual release of carbon dioxide and other greenhouse gases by man over several hundreds of years.

## Typical Examples of Pollution

**Water pollution**, as a result of:

- Spillages of diesel during tank filling that is then flushed into surface-water drains by rainwater.
- Surface run-off of fire-fighting water into a local brook during a fire.
- Incorrect use of a surface water drain for disposal of a chemical.
- Incorrect drainage connections where foul-water drains are connected to surface water out-feeds.

**Land pollution**, as a result of:

- Fly-tipping of hazardous waste.
- Leaks from storage tanks and drums.
- Contamination during demolition of an industrial building.

**Air pollution**, as a result of:

- The release of dust from an industrial site.
- Ventilation systems extracting contaminated air from an industrial process and discharging to atmosphere.
- The release of combustion gases from incineration.

It is worth noting that, in many instances, pollution in the air will be washed out of the atmosphere by rain and will then contaminate land. It can then drain through from the land and contaminate ground water and watercourses as well.

## Waste

### GLOSSARY

**WASTE**

What businesses and organisations throw away because they no longer need or want it.

All businesses and organisations produce waste in one form or another. The types of waste produced are often referred to as **waste streams**. For example, a large national building society (with hundreds of high-street branches and a large national headquarters) will produce paper and cardboard waste from its paperwork and promotional literature; catering waste from staff canteens; electronic equipment waste from old office IT equipment; and fluorescent tubes from thousands of strip lights.

All of this waste has to be disposed of in accordance with environmental legislation. In some instances this will be by landfill. In other instances, specific requirements will apply that make the disposal of the waste more difficult and expensive. For example, the de-gassing of refrigeration units, or the re-use and recycling of electrical equipment. Whichever specific method is used, there are costs associated with waste disposal.

### REVISION QUESTIONS

1. What is the environment?
2. How might pollution of water occur?
3. What are waste streams?

(Suggested Answers are at the end.)

## KEY INFORMATION

- Environmental impacts can be managed by the risk assessment process.
- Pollution events must be prevented and mitigating measures must be put in place to deal with pollution incidents.
- Waste can be managed using a waste control hierarchy of prevent, reduce, re-use, recover, dispose.
- Environmental management systems facilitate environmental management and can deliver benefits to an organisation.

The starting point for pollution and waste control is very similar to the starting point for hazard control: risk assessment. In the same way that **risk assessment** can be used as a tool to manage health and safety risk, so too can it be used to manage environmental risk.

The risk assessment method used is very similar to the one that we covered in Module 2. In fact, the same techniques and risk rating matrix can be used. All that is required is a slight change of perspective. Instead of thinking about hazards as things with the potential to cause harm to people, we start to think of hazards as things with the potential to cause harm to the environment. The same risk rating method can be used where we multiply likelihood by consequence; likelihood of a hazardous event and consequence to the environment.

Organisations need to focus on managing **pollution**. This involves identifying the reasonably foreseeable pollution events that might occur; risk assessing these events and then allocating appropriate resources and priorities to deal with each type of event. Preventive measures must be put in place in the form of pollution prevention strategies. Mitigating measures must also be put in place to deal with pollution incidents, should they occur. This will take the form of containment and clear-up procedures and equipment. It is also important that drills are carried out to test the effectiveness of emergency procedures and ensure that they will work in the event of a real incident. Pollution can be reduced by keeping within set limits for emissions to air, land and water.

## THE WASTE CONTROL HIERARCHY

Organisations also need to focus on managing waste. There is a simple waste control hierarchy that can be useful when considering the various options available. The waste control hierarchy is a list of waste control options with the most desirable and effective option at the top of the list and the least desirable option at the bottom:

- **Prevent** - by completely eliminating certain materials or activities from the workplace so that the associated wastes are eliminated. For example, elimination of a solvent-based paint-spraying operation not only eliminates the health and safety risk to workers, it also eliminates the discharge of solvent vapour to atmosphere associated with the paint-spraying operation.
- **Reduce** - by careful attention to the activities of the organisation to ensure that they are as waste efficient as possible. For example, maximizing efficient use of raw materials will ensure that as little raw material as possible is discarded during production.
- **Re-use** - by giving unwanted equipment or materials to others who can make use of them. For example, selling or giving old office IT equipment to others who can make use of what may be old but fully functional equipment.
- **Recover** - by recycling or converting waste to other useable forms. For example, paper and card can be recycled to manufacture other paper goods; plastic can be shredded and reformed into other plastic products; and waste food oil can be converted into bio-diesel.
- **Responsibly release or dispose of** - by the most appropriate disposal method. For example, office waste that cannot be reused or recovered might go to landfill via a licensed waste contractor.

This idea of the waste control hierarchy is similar to the risk control hierarchy covered in Module 3.

## ENVIRONMENTAL MANAGEMENT SYSTEMS

You may remember that in Module 4 we discussed health and safety management systems. Well, in just the same way that health and safety management can be facilitated by making use of a management system, environmental management can be made easier by making use of an **Environmental Management System** (**EMS**).

Environmental management systems are based around the same Plan, Do, Check, Act cycle as health and safety management systems.

Many organisations are certificated to **ISO 14001,** which is an externally verified environmental management system that shows that the organisation has a working environmental management system in place.


Structure of ISO 14001:2004

The key benefits of implementing an environmental management system are:

- It may be required in order to get a licence to operate.
- It may be required as a minimum standard by a client or customer.
- It facilitates better cost control.
- It enhances business reputation.
- It enhances public relations.

### REVISION QUESTIONS

4. What is the waste control hierarchy?
5. Name one benefit of implementing an environmental management system.

(Suggested Answers are at the end.)

## SUMMARY

In Module 8, we have:

- Defined the environment as the **air**, **land** and **water**.
- Outlined how organisations have an impact on the environment through both **pollution events** and the **waste** that they produce.
- Defined **pollution** as the release of hazardous substances or energy into the environment.
- Defined **waste** as anything thrown away by an organisation because it is no longer needed or wanted.
- Outlined how environmental impacts can be managed by the **risk assessment** process.
- Outlined that pollution events must be prevented and mitigating measures must be put in place to deal with pollution incidents.
- Outlined how waste can be managed using a **waste control hierarchy** of prevent, reduce, re-use, recover, dispose.
- Outlined how **environmental management systems** facilitate environmental management and can deliver benefits to an organisation.

# SUGGESTED ANSWERS


## NO PEEKING!

Once you have worked your way through the revision questions in this book, use the suggested answers on the following pages to find out where you went wrong (and what you got right), and as a resource to improve your knowledge and question-answering technique.

# IOSH Managing Safely - Module 1: Introduction to Managing Safely

## Question 1

In three words the reasons why an organisation should manage health and safety can be summed up as moral, legal and financial.

## Question 2

There are 155 fatal workplace accidents each year in the UK on average.

## Question 3

Three direct costs that might arise from a workplace accident could include:

- First-aid treatment.
- Employee sick pay.
- Repairs to, or replacement of, damaged equipment and buildings.
- Lost or damaged product.
- Lost production time whilst dealing with the injury.
- Overtime to make up for lost time.
- Costs associated with the rehabilitation of the injured employee and their return to work.
- Fines in the criminal courts.
- Compensation payable to the victim, which is likely to be met by insurance cover and will therefore result in an increase in insurance premiums.

Three indirect costs that might arise from a workplace accident could include:

- Loss of staff from productive duties in order to investigate the incident, prepare reports, undertake hospital visits, deal with relatives, attend court proceedings.
- Loss of staff morale (which impacts on productivity and efficiency).
- Cost of remedial action following an investigation, e.g. change of process or materials and/or the introduction of further control measures.
- Compliance with any enforcement notice served.
- Cost of recruiting and training temporary or replacement labour.
- General difficulties in recruiting and retaining staff as an indirect result of the accident.
- Loss of goodwill of customers following delays in production and fulfilling orders.
- Activation of penalty clauses for failing to meet delivery dates.
- Damage to public image and business reputation.
- Damage to industrial relations, perhaps leading to industrial action (e.g. strikes).

## Question 4

The minimum amount of employers' liability insurance that an employer must have is £5 million.

## Question 5

The punishment that a criminal court can give an individual who has been found to have broken health and safety law is a fine and/or imprisonment.

## Question 6

The fact that the employer is legally responsible for the health, safety and welfare of his employees has implications for individual managers working for the employer. It means that these managers are legally responsible for discharging the duties of their employer in the parts of the workplace and for the members of staff that they have control over.

## Question 7

In the first instance the employer might hold a manager to account for their actions or omissions with regards health and safety responsibilities. This might be done through the employer's internal performance management or disciplinary process.

However, in the event of a breach of health and safety law, the enforcement authorities might hold a manager to account for their actions or omissions with regards health and safety responsibilities. This would be done by an external investigation followed by a prosecution in the criminal courts.

## Question 1

A hazard is something with the potential to cause harm.

## Question 2

A hazardous event occurs when someone or something interacts with a hazard and allows it to cause harm.

## Question 3

The two main factors that are combined to give the degree or level of risk are likelihood of a hazardous event (or chance or probability) and consequence of that event (or severity of outcome).

## Question 4

Under the **Management of Health and Safety at Work Regulations 1999** an employer with five or more employees must record their risk assessment.

## Question 5

The six steps of risk assessment are:

1. List the work tasks.
2. Identify the risks.
3. Estimate the risks.
4. Evaluate the risks.
5. Record the findings.
6. Review the findings.

## Question 6

The types of groups of people that might be considered during the risk assessment process are:

- Employees carrying out the work.
- Other employees who might be affected by the hazard.
- Contractors and temporary staff working in the workplace.
- Visitors to the workplace.
- Members of the public..

## Question 7

The level of risk can be rated when estimating risk by allocating a numerical value (a score) to each of the two factors that combine to give the degree of risk: likelihood and consequence. These numerical values can be used to create a risk matrix.

The degree of risk can then be rated by multiplying the two scores together (Risk = Likelihood × Consequence), as shown on the matrix.

## Question 8

If, during the risk evaluation step of the risk assessment, the employer finds that the level of risk is unacceptable, then they must take action in a reasonable time to reduce the level of risk to a more acceptable level.

## Question 9

During a risk assessment it is important to record the significant findings. These will include:

- Detail of the location, equipment, substances and activities being assessed.
- The hazard identified and the people who are exposed to them.
- The existing controls and the current risk level.
- Any additional controls required.
- The date and time of the assessment and the person carrying it out.
- A review date.

## Question 10

A risk assessment should be reviewed:

- After any significant change – such as a change in work activity, substances being used, equipment being used, etc.
- After any incident – that might make you suspect that the assessment might not be valid, such as a near miss or accident.

It is good practice to review assessments periodically.

# IOSH Managing Safely - Module 3: Risk Control

## Question 1

The three main control options are to:

- Reduce the likelihood of the hazardous event occurring.
- Reduce the consequences of the hazardous event should it occur.
- Reduce both likelihood and consequence.

## Question 2

Residual risk is the risk that remains after control measures have been introduced as a result of the risk assessment.

## Question 3

The five options in the risk control hierarchy are:

- Eliminate the hazard.
- Reduce the hazard.
- Prevent people coming into contact with the hazard.
- Safe systems of work.
- Personal protective equipment.

## Question 4

Control options at the top of the hierarchy are preferable to those at the bottom of the hierarchy because they rely less on people remembering to do things in the correct way. They rely more on engineering a "safe place", rather than relying on a "safe person".

## Question 5

**So far as is reasonably practicable** is a legal phrase that means that the level of risk on the one hand has to be balanced with proportionate risk controls on the other hand. The cost of those risk controls can be measured in time, money and effort.

Risk controls that are disproportionately costly in terms of money, time and effort do not have to be done because they are not "reasonably practicable".

Risk controls that are in proportion to the risk should be done because they would be considered reasonably practicable.

# IOSH Managing Safely - Module 4: Understanding Your Responsibilities

## Question 1

Reasonably foreseeable risks are the risks that would be recognised by a competent person working in the type of work that you do.

## Question 2

- Common knowledge – recognisable by any reasonable person.
- Industry knowledge – recognisable by competent people in your industry or line of work.
- Expert knowledge – recognisable only by an expert in the field.

## Question 3

Any three characteristics from:

- Criminal action is started by the state.
- It is about punishment.
- Legal proceedings normally start within six months.
- Insurance is not available to pay the fine.
- It is concerned with breaches of statute law.
- The burden of proof is guilt beyond reasonable doubt.

## Question 4

Within three years from the date of the injury.

## Question 5

To demonstrate negligence the claimant must show that:

- A duty of care was owed to them.
- The duty of care was breached.
- They suffered an injury or loss as a direct result.

## Question 6

Contributory negligence is the idea that if a person is partly to blame for their own accident and injury then they should share some of the responsibility. They will be awarded a proportion of their compensation payment depending on how much to blame they were.

## Question 7

Vicarious liability is the idea that an employer can be held vicariously liable for the negligent acts of his employees when they are carrying out his work.

## Question 8

Acts and Regulations.

## Question 9

Approved Codes of Practice (ACoP) and Guidance.

## Question 10

**Improvement Notice** – this allows work to continue but requires that the employer makes specific improvements to achieve legal compliance within a specified timescale.

**Prohibition Notice** – this stops a particular high risk work activity from taking place until such time as it has been made safe.

## Question 11

- Plan.
- Do.
- Check.
- Act.

# IOSH Managing Safely - Module 5: Identifying Hazards

## Question 1

The four main routes of entry for hazardous chemicals into the body are:

- Inhalation.
- Ingestion.
- Absorption through the skin.
- Injection through the skin.

## Question 2

The first step in managing the risk associated with chemicals is to carry out a risk assessment as required by the **Control of Substances Hazardous to Health regulations 2002** (a **COSHH** assessment).

## Question 3

Personal hygiene is important when people are working with chemicals because it is very easy to cross-contaminate the skin and the mouth. This can be done when handling the chemical, when removing protective clothing and when eating, drinking or smoking.

## Question 4

The main health risks associated with the use of Display Screen Equipment (DSE) are Work Related Upper Limb Disorders, eye strain, back pain, fatigue and stress.

## Question 5

The basic characteristics of a chair suitable for DSE use are that it should have a stable five-star base, adjustable height seat, adjustable height and tilt back, and lumbar support for the back.

## Question 6

The main hazards of electricity are electric shock, burns, fire and explosion, arcing and secondary effects.

## Question 7

An electrical fuse forms a weak link in the circuit. If the current is too great for the fuse then the wire inside the fuse becomes hot and melts. This breaks the circuit.

## Question 8

A competent person can carry out work on electrical equipment and systems at work.

## Question 9

The fire triangle is fuel, oxygen and heat (or an ignition source) - the three things that are needed in order for fire to burn.

## Question 10

The fire triangle can be used in fire prevention because when the three components of the triangle are kept apart then fire cannot start. So keep fuels separate from heat and ignition sources.

## Question 11

The main types of fire extinguisher are Water, Foam, Carbon dioxide, Dry powder, and Wet chemical. Any three of these.

## Question 12

Manual handling is pushing, pulling, lifting and carrying of a load by bodily effort. Any equivalent definition would work just as well.

## Question 13

The four main factors that have to be assessed during a manual handling risk assessment are Task, Individual, Load and Environment.

## Question 14

Slip, trip and fall accidents are responsible for the greatest number of broken bones.

## Question 15

A mandatory sign is round and blue (with a white pictogram showing what must be done).

## Question 16

The main health and safety risks associated with exposure to loud noise are noise induced hearing loss, tinnitus, stress and an inability to hear alarms, warnings and instructions.

## Question 17

The first thing that an employer must do when workers are exposed to excessive noise levels is carry out a noise assessment.

## Question 18

The two different types of hearing protection are ear defenders (or muffs) and ear plugs.

## Question 19

Stress is the adverse reaction that people have to excessive pressure or other demands placed upon them.

## Question 20

The three different types of effect that stress can have are psychological, physical and behavioural.

## Question 21

In order to minimise the risk of stress an employer should ensure that a management framework is in place which takes into account the causes of stress. This includes ensuring that the demands of the job are reasonable, which means that the job must always be realistically do-able by the person who is being asked to do it.

## Question 22

The health effects of working in a very hot environment include heat stress, dehydration, muscle cramps and heat stroke. Any one of these would be fine.

## Question 23

The minimum indoor workplace temperature for a workplace where people are doing sedentary work is 16°C.

## Question 24

The three main factors that must be managed to control the risks associated with vehicle operations are the workplace, the vehicle and the driver.

## Question 25

The four control measures that must be in place with regards the driver of any vehicle used for work purposes are:

- The driver must be competent to drive the vehicle (this may require them to hold a certificate or a licence).
- They must be fit to drive.
- They must be provided with adequate information, instruction and training on safe use of the specific vehicle they are going to drive.
- They must be adequately supervised.

## Question 26

- Typical symptoms of Hand Arm Vibration Syndrome (HAVS) are 'Vibration white finger,' loss of sensation in the fingers, muscle weakness and joint damage.

## Question 27

Vibration exposure can be controlled by Reducing (or eliminating) the vibration at source, interrupting the transmission of the vibration or limiting the duration of exposure.

## Question 28

Work-related violence is any incident in which a person is abused, threatened or assaulted in circumstances relating to their work.

(Any similar definition is fine)

## Question 29

The types of work activity are commonly associated with higher risk of work-related violence are:

- Cash handling.
- Lone working.
- Representing authority.
- Wearing a uniform.
- Dealing with people under stress.
- Dealing with people under the influence.

## Question 30

The first step in managing the risk of work-related violence is to discover if you have a problem in the workplace and if so the exact nature of the problem.

## Question 31

The basic welfare requirements that an employer has to make for his workers are access to drinking water; sanitary conveniences; washing facilities; changing rooms and storage for clothing; and places to rest and eat food.

(Any three from six.)

## Question 32

'Work at height' means work where there is a risk of a fall liable to cause personal injury.

## Question 33

The first option in the hierarchy of control set out in the **Work at Height Regulations** is to avoid working at height.

# IOSH Managing Safely - Module 6: Investigating Accidents and Incidents

## Question 1

An accident is an unplanned, unwanted event that leads to injury, damage or loss.

## Question 2

Accidents should be investigated for the following reasons:

- To identify the immediate, underlying and root causes.
- To prevent recurrence.
- To record the facts for future reference.
- For legal reasons.
- For claims management purposes.
- To help staff morale.
- For disciplinary purposes.
- To gather data for accident statistics .

(Any three of the above.)

## Question 3

Immediate causes are the unsafe acts and unsafe conditions that exist at the time and place of the accident and led directly to the event.

Root causes are the management failures that have allowed the underlying and immediate causes to come about.

## Question 4

An accident record should note the following information:

- Name and address of casualty.
- Date and time of accident.
- Location of accident.
- Details of injury.
- Details of treatment given.
- Description of event causing injury.
- Details of any equipment or substances involved.
- Witnesses' names and contact details.
- Details of person completing the record.
- Signatures.

(Any three of the above.)

## Question 5

The main events that have to be reported to the enforcing authorities under **RIDDOR** are:

- Fatality.
- Major injury.
- Dangerous occurrence.
- Disease.
- Over-seven-day injury.

(Any three of the above.)

## Question 6

Factual information from the scene might be recorded by means of:

- Photographs.
- Sketches.
- Measurements.
- Videos.
- Written descriptions of factors such as wind speed, temperature, etc.
- Taking physical evidence.

## Question 7

To get good information from the witness a witness interview should be conducted using the following techniques:

- Hold the interview in a quiet room free from interruptions.
- Introduce yourself and the reason for the interview.
- Try to establish rapport using verbal and body language.
- Use open questions.
- Keep an open mind.
- Take notes.
- Ask the witness to write a witness statement.

## Question 1

The two main ways of measuring performance are reactively and proactively.

## Question 2

The injury incidence rate is calculated as the number of reportable injury accidents occurring over a specific period of time (such as a year) expressed as a proportion of the average number of workers employed over that period of time.

$$\text{IIR} = \frac{\text{Number of reportable injuries during a specific time period (e.g. a year)}}{\text{Average number of workers over the same time period}} \times 100{,}000$$

(The answer is in units of 'reportable injuries per 100,000 workers'.)

## Question 3

Health and safety performance can be proactively measured by measuring the successful completion of key health and safety objectives or tasks. This is normally done by measuring the degree of compliance with a recognised standard. For example, one proactive key performance indicator might be the percentage of successfully completed of safety inspections in line with the company standard.

## Question 4

The organisation's health and safety management system is critically examined during a health and safety audit.

## Question 5

The three separate sources of information that are normally used by an auditor are:

- Documents and records.
- Managers and other staff.
- Direct observation of the workplace and work activities.

## Question 6

Some of the advantages of external auditing are:

- Independent of any internal influence.
- Fresh pair of eyes.
- May have wider experience of different types of workplace.
- Recommendations often carry more weight.

Some of the disadvantages of external auditing are:

- Expensive.
- Time consuming.
- May not understand the business so make impractical suggestions.
- May intimidate workers so get incomplete evidence.

(Any one from each.)

# IOSH Managing Safely - Module 8: Protecting Our Environment

## Question 1

The environment is the air, land and water that makes up the planet.

## Question 2

Pollution of water might occur by any deliberate or accidental release or discharge of hazardous substance or energy into water.

For example:

- Spillages of diesel during tank filling that is then flushed into surface-water drains by rain water.
- Surface run-off of fire-fighting water into a local brook during a fire.
- Incorrect use of a surface-water drain for disposal of a chemical.
- Incorrect drainage connections where foul-water drains are connected to surface-water out-feeds.

(Any one of the above.)

## Question 3

Waste streams are the different types of waste that are disposed of by any organisation, such as paper and card, electrical equipment, plastics and metal.

## Question 4

The waste control hierarchy is a list of waste control options with the most desirable and effective option at the top of the list and the least desirable option at the bottom:

- prevent,
- reduce,
- reuse,
- recover,
- dispose.

## Question 5

One benefit of implementing an environmental management system might be:

- It is a requirement in order to get a licence to operate.
- Required as a minimum standard by client or customer.
- Facilitates better cost control.
- Enhances business reputation.
- Enhances public relations.

(Any one of the above.)